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SIERRA LEONE.

Annual Report

OF THE

Department of Agriculture For the Year 1936.

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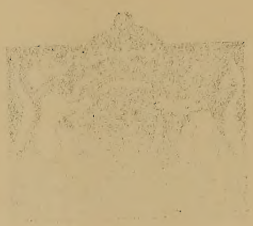

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DEPARTMENT OF AGRICULTURE.

REPORT FOR 1936.

I have the honour to submit my report for the year ending December, 1936.

Policy.—The following is a summary of the agricultural policy now adopted by Government :—

A. The adequate provision of food for the people. This is to be accomplished by—

(i) The improvement and spread of swamp rice cultivation to such an extent that not only will the needs of the people be supplied but there will be a surplus for export.

(ii) The better cultivation of inland swamps and valleys and the introduction of the cultivation of crops, other than rice, in swamps during the dry season.

(iii) The extension of garden crops to serve as an auxiliary food supply.

(iv) The selection (or introduction) and distribution of seeds and plants suitable for (i) to (iii).

(v) The improvement of poultry and stock.

B. The cultivation of money crops or exploitation of wild trees for export purposes. These crops or products include—oil-palms, cocoa, coffee, rice (*see A* (i)), ginger, kola, chillies, fruits and piassava.

C. The arresting of the deforestation of Sierra Leone or at any rate increasing the regeneration period between successive " brushings " of the same area, by—

(i) encouraging swamp and valley cultivation as an alternative to upland farming ;

(ii) investigating means of establishing a more permanent form of upland farming than the present shifting cultivation.

D. The improvement in the preparation and marketing of produce. This includes—

(i) the use of rice milling machinery ;

(ii) introduction of co-operative methods in Scarcies rice area.

E. The preservation of the standard of export produce by inspection. Produce for which standards are already fixed are palm-oil, palm kernels, piassava, ginger, raffia, rice and fruit.

F. Co-operation with the Education Department where possible in the teaching of agriculture.

G. All extension work and propaganda must be based on the results of experiments and experience obtained by Agricultural Officers within Sierra Leone.

SECTION I—GENERAL REVIEW OF CROPS INCLUDING EXPORTS.

Rice.—The past year was an unfortunate one for upland farmers. Owing to early rains the burning of farms was seriously interfered with and in many areas great difficulty was experienced in clearing for cultivation the whole of the area of land originally brushed. As a result, not only was a smaller area planted, but on the whole it was planted later than usual, owing to the extra time required to clean it. It is estimated that in the areas affected, from 20 to 25 per cent. of land originally brushed was not planted on account of bad burns, and in some chiefdoms it was said to be more. The rains continued longer than usual, and, owing to this and late planting, the rice crop was harvested some four weeks later than is generally the case. This caused some shortage of rice in September to October, but it also shortened the time that the new crop has to last.

2. While the rains affected the rice crop as indicated, another cause led to a further small reduction in the size of the rice crop. During the last few years there has been a rapid development in the mining industry; in 1936 the numbers employed were greatly increased and by the end of the year some 14,000 labourers were employed. As agriculture is the only industry other than mining in the country, these labourers have been diverted from agriculture to mining during the last few years. It is estimated that each labourer engaged in mining is either issued with or buys at least one pound of rice a day, so that not only was the production of rice cut down by the amount 14,000 able bodied men would have produced, but an internal market has been created for over 2,000 tons* of rice to feed these labourers. Big towns are rapidly springing up in the mining areas and it is estimated that the number of people including wives, families, hangers-on, traders in the mining area, etc. is at least four times the actual number of labourers engaged. This will increase the demand for rice and other foods from people who have recently become non-producers. It is estimated that the internal rice market created by the mining industry is at present about 4,000 to 5,000 tons and this will have to be supplied before the export of rice which was contemplated in 1934 can be achieved. The relation of the demand of the mining industry (4,000 to 5,000 tons a year) to the total production of the country (now estimated at 175,000

*Whenever the word "tons" is used in this Report it means "Long tons."

tons a year) is very small and can easily be supplied in a year of normal production. In a year of good climatic conditions there should be a surplus of rice, and so steady has been the increase in the production of rice, that even in normal weather conditions there should shortly be a surplus for export.

3. For upland farmers weather plays the most important part in production. Unduly early rains mean bad burns, a smaller area cultivated, more trouble from weeds and consequently a reduced crop. Wetland farms do not suffer in the same way and the steady increase in the use of swamps is one of the most encouraging factors in Sierra Leone farming.

4. The swamp rice crop this year was rather above normal in most parts of the country and definitely above normal in the Scarcies area, but the wetland crop is still small when compared with the total production of dry land rice and this increase in swamp rice did not offset the poor crops from the upland areas.

5. Thus there was a decrease in rice production in 1936 and an increased demand owing to the rapid development of the mining industry. It is not, therefore, to be expected that the export of native rice, of which 1,024 tons was exported in 1935, would be continued in 1936. In the early months of the year some 200 tons were exported, but as soon as it became apparent that rains were interfering with farming, the export of rice stopped.

6. In December a meeting of traders interested in rice trading was held. The meeting thought there would be a shortage in 1937 owing to the 1936 dry land crop being short and owing to the demands of the mines. Recommendations involving the restrictions of exports, the removal of import duties and the control of prices were forwarded to Government who approved of the recommendations and subsequently took the necessary steps to implement them.

7. The 1936 rice season, or perhaps it would be more suitable to describe it as the 1936-1937 season, since much of the swamp rice sown in 1936 is not harvested till January or February in the following year; affects the 1937 food supply more than the 1936 food supply; and it is thought that rice will be somewhat short in 1937 until September when the new harvest begins. Steps have already been taken to deal with the situation and Government has placed orders for the importation of rice during May, 1937. As soon as notice of the removal of the duty was given certain firms also placed orders abroad for rice, and it is anticipated, that, provided the situation is not far different from that reported by Political Officers, Agricultural Officers and rice traders in December, the steps taken as a result of the December meeting should prove sufficient to meet the situation in 1937.

8. One point connected with the rice market should not be overlooked. When the price of palm kernels rises the native farmer will not part with his rice cheaply and the price of rice automatically rises. Moreover, the farmer tends to eat more rice himself when the money which he receives for his kernels enables him to do so. The amount of rice marketed by producers is therefore less, and the price is higher, when the price of kernels goes up. The price of kernels at the end of the

season rose very sharply and the price of rice also increased. So long as the prices of produce generally, and of kernels in particular, remain at their present level it is not anticipated that the low prices for rice, which existed for the last four years, will again be reached. Nor is it a good thing that the rice farmer should receive so little for his labour as he has done recently.

9. The imports and exports since 1930 are given below :—

	——	Imports, White Rice, Tons.	Exports, Native Rice, Tons.	Excess (+) or Deficit (−) of Exports over Imports, Tons.
Average	1920-29 ..	986	96	— 890
	1930 ..	2,618	175	— 2,443
	1931 ..	457	177	+ 280
	1932 ..	301	559	+ 258
	1933 ..	125	158	+ 33
	1934 ..	81	221	+ 140
	1935 ..	29	1,024	+ 995
	1936 ..	45	204	+ 159

10. *Palm Kernels.*—In 1936 the export of palm kernels reached a new quantity record of 84,578 tons valued at £810,238; the value being the estimated value f.o.b. This record is 6,559 tons above the previous record (1935) and the exports since 1920 are given below :—

	——	Tons exported.	£
Average	1920-29 ..	58,150	1,024,798
	1930 ..	56,641	664,591
	1931 ..	54,462	449,742
	1932 ..	77,162	687,477
	1933 ..	64,084	472,824
	1934 ..	68,655	470,780
	1935 ..	78,019	583,645
	1936 ..	84,578	810,238

11. An interesting feature of the increase in the export of kernels is that the increase has come not only from the "line area" but also from areas served by water transport especially in the Southern Province.

12. The following figures show from which areas the kernels have been exported :—

——	Export from Southern River Area through Bonthe and Sulima. Tons.	Export from "Line" Area through Freetown (Railments). Tons.	Export of Water-borne Kernels chiefly from Northern Rivers through Freetown Tons.
1930 ..	19,624	27,666	9,351
1931 ..	15,356	32,992	6,114
1932 ..	23,993	41,933	11,044
1933 ..	19,931	33,294	10,859
1934 ..	22,114	33,925	12,614
1935 ..	23,545	43,106	11,368
1936 ..	27,217	44,416	12,965

13. It will be seen that the biggest increase in 1937 has been shown in the Southern Rivers area and the quantities exported show a considerable advance on previous years.

14. The price of kernels throughout the year varied considerably. In January the average price (Liverpool) was £12 5*s*. 9*d*. a ton; this decreased to about £9 14*s*. 9*d*. in May but afterwards improved to £13 18*s*. 6*d*. in November and finally went up to £17 2*s*. 0*d*. for December. The actual closing price at the end of the year was £18 10*s*. 0*d*. The local (Freetown) prices are about £4 less than the European prices, so the rise in price from a minimum of £5 5*s*. 0*d*. in May to a maximum of £13 5*s*. 6*d*. in December was more marked in the local markets than on the European market. The high price paid for kernels undoubtedly stimulated production and it is a comforting fact that while production varies from year to year the general trend is towards increased production, and the past history of the kernel industry is that palms once cleaned and exploited for kernels will again be exploited even though the price may fall, as witness the high output and low price in 1932.

15. *Palm-Oil.*—The exports of palm-oil have gone down. This is probably not due to any falling-off in production, which following kernel production has possibly increased, but due to the fact that palm-oil is the main fatty food of the country and that the people engaged in the mining industry are providing an increasing local market for this product.

16. As in the case of palm kernels, palm-oil declined in price from January (£20 10*s*. 0*d*.) to May (£15 10*s*. 0*d*.) and improved considerably from then to December (£26 18*s*. 0*d*.) :—

		Tons exported.	£
Average	1920–29	2,562	81,742
	1930	3,652	79,310
	1931	1,359	19,830
	1932	2,208	26,914
	1933	1,619	16,637
	1934	2,225	18,032
	1935	2,892	35,814
	1936	1,222	16,303

17. *Kola.*—The quantity of kola exported during 1936 was the largest exported since 1929 but the price was the lowest except for the year 1934. There is no evidence yet of the recovery in kola prices as is the case with the prices of other forms of produce. A recovery in kola prices would however, be one of the greatest assets to Sierra Leone farmers.

		Tons exported.	£
Average	1920–29	2,932	279,678
	1930	2,271	186,197
	1931	1,584	47,847
	1932	2,085	41,373
	1933	1,812	43,656
	1934	1,460	18,304
	1935	1,859	39,415
	1936	2,301	41,539

18. *Ginger.*—There was only a slight increase in the amount exported in 1936 (1,642 tons) compared with that exported in 1935 (1,506 tons), but there was a welcome recovery in prices which reached those of the years before the slump.

19. The quality of the ginger was the best for many years owing to increased propaganda and inspection by the department. Extra produce inspectors were drafted into the ginger producing areas and agricultural instructors toured the area teaching producers. As a result the ginger was cleaner, drier, less mouldy and a far more satisfactory product to handle, losses by firms dealing in ginger being cut down considerably as a result of better drying.

		Tons exported.	£
Average	1920–29	1,582	56,778
	1930	1,972	57,228
	1931	1,927	32,518
	1932	1,382	22,877
	1933	1,545	16,543
	1934	1,659	23,254
	1935	1,506	36,918
	1936	1,642	58,672

20. *Piassava.*—Exports were maintained at a high level of both quantity and quality and prices showed an improvement on the previous year. The development of this industry is most interesting. There are two qualities—the Sherbro quality (sometimes called Prime Sherbro) and the Sulima quality. Inspection of piassava commenced in 1928 and it is interesting to note that at that time good Calabar piassava stood at £40 a ton compared with good Sherbro at £30. Years of steady improvement resulting from inspection has reversed the comparative value of these two types of piassava and Sherbro was recently (March, 1936) quoted at £30 a ton with Calabar at £25. (Quotations from the price lists issued by Messrs. Graves and Skinner, Liverpool). While this premium for Sherbro over Calabar is somewhat higher than usual, there is no doubt that Prime Sherbro piassava is now second to none from the West Coast.

21. Sulima piassava has also improved but not at the same rate. The best Sulima fibre is now being shipped separately as " First quality Sulima " ; it commands a premium on ordinary Sulima and it is hoped that this is a real step in the improvement of this grade.

		Tons exported from all Areas.	£
Average	1920–29	1,645	22,707
	1930	2,417	36,582
	1931	3,150	31,846
	1932	2,877	23,290
	1933	3,499	30,108
	1934	3,659	30,390
	1935	3,438	30,997
	1936	3,528	32,776

22. In past years only the total exports of piassava have been given, but this year the exports from the Sulima area and the Sherbro area are also given in order to show the development in the separate areas.

**Sherbro Area.*

——	Tons exported.	Value. £	Local Price per ton. £ s. d.
1930	663	14,356	21 11 0
1931	748	10,914	14 12 0
1932	615	8,440	13 14 0
1933	1,145	15,232	13 6 0
1934	852	13,575	15 19 0
1935	1,096	16,015	14 14 0
1936	798	11,261	14 1 0

**Sulima Area.*

1930	1,754	12,226	7 0 0
1931	2,402	20,932	8 14 0
1932	2,262	14,850	6 12 0
1933	2,354	14,256	6 1 0
1934	2,807	16,815	5 18 0
1935	2,342	14,982	6 8 0
1936	2,760	21,515	7 16 0

23. While it is thought that the "Local price per ton" given in the Trade Report is on the low side, these figures bear out strongly the value of the better preparation of fibre. They show that the Sulima native only receives as much for two tons of his piassava as the Sherbro native does for one. It is true that the Sulima man does not spend so much time per ton cleaning, but he has to clean twice as much and the ultimate rate of remuneration for his labour is less. Moreover he uses twice as many piassava stalks to obtain the same amount of money and is often reduced to using immature material. Propaganda in the remote Sulima area is difficult to supervise and progress is slow; nevertheless progress is being made.

24. *Cocoa.*—There has been a very welcome increase in the amount of cocoa exported and a new record of 301 tons was reached. In view of the very limited success which attended the somewhat indiscriminate propaganda carried out some years ago this increase is very encouraging; and a careful study shows that while cocoa cannot be planted just anywhere in the Colony, it can be grown with success on suitable locations in the high bush country. The areas on which cocoa can be planted with reasonable prospects of success by native farmers have been carefully noted. They are chiefly in the high bush country and form only a proportion of the total farm lands in that area, yet sufficient suitable land exists to multiply the present export many times. This matter is being carefully considered and although the indiscriminate propaganda carried out in the Southern Province years ago will not be repeated, a considered programme of development in the high bush areas of the

*Figures from Trade Report, 1936.

Protectorate will be undertaken as soon as suitable staff can be trained to carry out the necessary instruction and supervision.

		Tons exported.	£
Average	1920–29	43	1,475
	1930	80	2,548
	1931	61	1,034
	1932	81	1,295
	1933	67	990
	1934	138	1,755
	1935	164	2,043
	1936	301	5,542

25. *Coffee.*—There was a slight increase in the exports (13·5 tons at £324) of coffee which was the highest that it has been for the last ten years. The extension of the growth of this crop is slow but is steadily increasing. This increase is not altogether reflected in exports as there is a growing demand for coffee for local consumption.

26. *Cattle.*—There was an increase in the quantity of hides exported in 1936 (604 cwts.)* compared with 1935 (388 cwts.) and this reflects the increased prosperity of the country. The greater proportion of the cattle slaughtered in Sierra Leone are imported from French Guinea and the increase in cattle slaughtered show that the inhabitants have money to spend on meat. The figures given below show the falling-off during the depression and the partial recovery during 1936.

27. The exports since 1929 are as follows :—

	Cwts.	£
1929	876	4,654
1930	840	2,853
1931	620	1,687
1932	540	1,223
1933	580	987
1934	440	692
1935	388	1,156
1936	603	1,821

28. The 1936 figures compared with the 1935 figures show an increase in the quantity of hides tanned locally as well as those exported untanned : these locally tanned hides were exported to the Gold Coast.

	1935.		1936.	
	Cwts.	£	Cwts.	£
Hides and skins—tanned ..	124	770	192	1,197
,, ,, untanned ..	263	374	411	624

29. *Beeswax.*—There was an encouraging increase in the export of beeswax due largely to the efforts of the District Commissioner, Karene, from whose district most of the wax comes. Altogether 58 cwts. of wax were exported and this sold at a rate of 107*s.* a cwt. for the dark coloured wax and 113*s.* a cwt. for the light coloured wax.

*Wherever the word "cwts" is used in this report it means "Long cwts."

30. The exports since this industry was started in 1934 are :—

	Cwts.	£
1934	15	65
1935	37	182
1936	58	287

31. *Garden Crops.*—During the last ten years there has been a very noticeable increase in the production of foodstuffs other than rice. These include yams, bananas, plantains, sweet potatoes, beans, cassava and various vegetables. Not only are these foodstuffs becoming consumed in increasing amounts by the actual farmers, but a definite trade is growing up as is evidenced by the increasing amounts carried on the railway. The amount of native foodstuffs (other than rice) carried on the railway from 1926 to 1936 is as follows :—

Year.	Tons.
1926	1,902
1927	2,517
1928	2,297
1929	2,382
1930	2,113
1931	2,746
1932	2,897
1933	2,539
1934	3,938
1935	3,127
1936	3,641

32. The increase in the production of native foodstuffs is most welcome since it adds a variety to the native diet which is still composed of too great a proportion of rice. Moreover, any increases in production of these foodstuffs releases rice for consumption elsewhere or for export, while transport on the railway assists railway revenue—a not unimportant point. In order to see in which districts production was increasing a search was made in the railway records to see which stations were railing foodstuffs, and it was found that the whole of the increase (1,700 tons) came from the Moyamba District. The figures are :—

Year.	Mano, Tons.	Kangahun, Tons.	Moyamba, Tons.	Bauya, Tons.	Rotifunk, Tons.	Bradford, Tons.	Mabang, Tons.	Total Mano-Mabang, Tons.
1926 ..	88	65	19	18	93	33	61	379
1927 ..	122	84	44	35	159	50	97	591
1928 ..	115	46	45	52	51	24	29	362
1929 ..	104	52	56	22	77	12	29	352
1930 ..	114	74	51	32	130	51	14	466
1931 ..	175	96	130	31	197	77	99	805
1932 ..	417	89	112	37	366	61	72	1,154
1933 ..	295	85	89	37	295	59	59	929
1934 ..	782	313	242	141	140	261	134	2,013
1935 ..	603	151	241	185	150	237	197	1,764
1936 ..	510	239	224	259	206	385	360	2,183

33. This is most interesting since it is in the Moyamba District that the departmental farm—Njala—is situated and it is in this district

that we have concentrated our efforts in recent years. Prior to 1929 the efforts of the Agricultural Officers were dispersed throughout the Protectorate in order to cover as large an area as possible, but following discussions with the Agricultural Adviser to the Secretary of State, Mr. (now Sir) F. A. Stockdale, during his visit in 1929, the work of the department was concentrated in areas in which Agricultural Officers could give continuous supervision. The Moyamba District was one of these areas and the results were most gratifying and immediate, for it will be seen that the increase in production (as reflected by railway exports) only took place after 1929.

34. This branch of the work of the department, the increase of native foodstuffs, is often not appreciated at its true value. It does not show up in the Blue Book, it brings no wealth to trading firms, but nevertheless it is regarded by the department as one of its most important functions and there is no doubt that in a bad rice year, such as 1936 undoubtedly was in the Moyamba District, the increase in the production of these alternative food crops will do much to alleviate the distress which is always caused by a bad rice crop.

SECTION II—WORK OF THE DEPARTMENT OF AGRICULTURE.

35. Although still handicapped by a shortage of staff, which was this year further accentuated by sickness, considerable progress was made, especially with rice work in the Northern Province. The maintenance of research work at the Rokupr rice farm and its extension in the Scarcies area was considered to be first in order of importance, and the staff of the Southern Province was robbed in order to maintain two Agricultural Officers always at Rokupr for work in the Scarcies. It is pleasing to be able to record that immediate success has attended the work of the department in the Scarcies. The demand by native farmers for better seed rice and for the formation of more "Farmers Societies" have risen to such proportions that not only have the two Agricultural Officers been kept fully occupied but further assistance will have to be given during the next year if the development of work is to go on with the vigour and success shown during the last few years.

NORTHERN PROVINCE.

36. *Rice.*—The Seed Distribution Scheme, started in 1935, has proved a most satisfactory way of spreading improved varieties of rice. A variety of rice imported from India known as G.E.B. 24 proved so successful in 1935, that it was again distributed. Some 1,441 bushels of seed were distributed to 339 farmers in the Scarcies and Port Loko areas and the cultivation of this rice was supervised both in the nursery and on the farms, rogueing being done where necessary to keep the seed pure. Better methods of drying the rice after cutting the crop were also taught as well as the necessity of thorough drying before stacking. It is estimated that some 20,000 bushels of G.E.B. 24 were produced during the year and the rice sold at a premium of at least 3*d*. per bushel husk (paddy) over other varieties. Farmers receiving seed agreed to repay the seed received plus 25 per cent. and at the time of writing practically all this has been recovered. Nearly 2,000 bushels therefore, are now on hand for distribution during 1937 and there are far more

applicants for this rice than seed available from departmental sources. Seed, however, is now available from other sources and in a few years time a revolution will have been worked over part of the Scarcies and G.E.B. 24 will have replaced, to a large extent, the inferior varieties now cultivated in certain areas.

37. G.E.B. 24 is not suitable for all conditions, and varieties of rice suitable for deep water and saline conditions were distributed to selected farmers. Some 32 bushels of Kavunginpoothala, Panianala and Baitel Fakir were given out for trial to 57 farmers while 6 bushels of Bali, a salt resisting variety, were issued for trials on four farms in the salt area. Among other seed distributed were 39 bushels of Co. 7 (a long duration variety) to 15 farmers.

38. The main object of these seed distributions is to find out which varieties are best suited to given conditions of flooding but no varieties are distributed which have not been grown successfully by the department in somewhat similar conditions. Swamps vary in regard to depth of water and length of time flooded, while the water varies from fresh to brackish. These factors interact with each other and the selection of the best varieties to suit given conditions is a matter of careful trial. A wealth of information is being built up and there is little doubt that the proper selection of high yielding strains and their distribution to the areas where the conditions are best suited to them, will do much to increase the yield from the Scarcies area, while the use of deep water and salt resisting varieties will allow the area at present under cultivation to be extended considerably.

39. This systematic application of scientific principles to the breeding, selection and distribution of a crop which is a vital necessity to the Colony has met with the most whole-hearted response from the farmers themselves, a response which owing to our small staff is so enthusiastic as to be definitely embarrassing. No introductions of money crops such as cotton or coffee, and no trials of agricultural machinery, have ever attracted the attention of the farmer as has this marked improvement in a crop that he has already been growing himself for generations. It will be years before our small staff can deal adequately with all the problems involved in the Scarcies, but the daily queue of farmers waiting at the Agricultural Office at Rokupr just to give in their names to receive assistance from the Seed Distribution Scheme is most encouraging to the officers concerned, and shows very clearly that the way to gain the confidence of the farmer is to assist him in growing his own crops.

40. *Co-operation.*—A Farmer's Society was started at Mambolo the object of which was to try out the response of farmers in the Scarcies area to co-operative ideas and methods. In this first year co-operation was confined to the marketing of the rice crop (G.E.B. 24 was grown) and the members of the society under the guidance of the department pooled their crop, engaged transport to take it to Freetown and paid for the milling of the rice and its subsequent sale. The result was that a decidedly higher price per bushel was obtained than would have been obtained by their ordinary methods of marketing (sale of husk or native cleaned rice to Syrian traders) immediately after harvest. The society was also made a medium for propaganda and at the meetings members

were instructed in better methods of cultivation, including the rogueing of that part of their farm reserved for seed, and the proper drying of the rice after cutting. They were also instructed with regard to the benefits which might be expected by growing better types of rice and by selecting those types of rice which best suited the conditions in their farms.

41. Only 24 members were admitted to this society. To-morrow the number could be easily increased to over a hundred and demands for the formation of other societies in other parts of the Scarcies have been received. Unfortunately the staff in the Scarcies area already have so much on hand that until it can be increased it will be impossible to go much further ahead with co-operative work. This preliminary society has shown very definitely that the farmers of the Scarcies are only too willing to take advantage of co-operative methods but it has also shown that, at any rate in its initial stages, all co-operative work will have to be most carefully supervised. Until that supervision is available (and it is to be hoped that it will shortly be forthcoming) it would be a mistake to rush ahead with co-operative schemes.

42. *Yams.*—The distribution of seed has not been confined to rice. Yams are now distributed in the same manner and last year 2,971 lbs. were distributed and this quantity plus 25 per cent. by weight were returned by farmers. By this means an ever increasing seed supply is being built up and the method is well understood and much appreciated by the farmers. Only small quantities of yams were given to each farmer (10-20 lbs.) and some 200 farmers received seed last year.

43. *Rokupr Rice Research Station.*—A report of the work at the Rokupr Rice Station is attached as Appendix I. This report shows that considerable progress has been made during the year and the purification of varieties of local rices is going ahead. We now have pure strains of the best of the local varieties and it is hoped that by further selection it will prove possible to increase the yields of these varieties. This station provides great interest for the farmers in the neighbourhood, who visit the farm and watch with the keenest interest the progress of new introductions of rice. Rokupr has already made its mark on rice production in the Scarcies and its influence will increase from year to year as the value of better seed and better methods of cultivation and harvesting are brought home to the rice farmer.

44. *Extension work in other parts of the Northern Province.*—With the concentration of work in the Scarcies the other parts of the Northern Province can receive only limited attention from the Agricultural Officers at Rokupr and although the Agricultural Instructors at sub-stations are doing good work the rest of the Province naturally suffers. There is an urgent need to increase food production in the mining area. Already the steady wages paid to the labourers and the high cost of food owing to the demands of the influx of mine labourers has resulted in lowering the status of the ordinary farmer in the mining area. Unless something is done to assist him, the drift from the land to the mines in the mining area will be greater than the area can stand, while the supply of native foods other than rice (rice can be imported into the district from elsewhere) will, in particular, be adversely affected. An application for assistance to the Mining Benefits Fund has been made and it is hoped that the necessary assistance will be forthcoming.

SOUTHERN PROVINCE.

45. Owing to leave and sickness, and the need for keeping two Agricultural Officers in the Scarcies area, only for one month during 1936 were two Agricultural Officers available for work in the Southern Province; during the rest of the year only one officer was available. The Agricultural Officer, Southern Province, reports:—"For another year, therefore, district work in the Southern Province was negligible and investigational work at Njala had likewise to be curtailed." Notwithstanding this self-depreciatory report of the Agricultural Officer and the shortage of staff, the investigational work at Njala was continued although no fresh lines of work could be undertaken; and district work was carried out by the African staff with the limited supervision which could be given from Njala.

46. *Rice.*—The success of G.E.B. 24 in the Northern Province led to the introduction of this rice in the Southern Province and it was distributed to 21 farmers: the results have been most promising and there is already an increasing demand for seed. A survey of the tidal mangrove areas and the swamp behind them in the Moyamba District was commenced by Mr. G. M. Roddan, but unfortunately he had to be recalled from this work to take over from Mr. R. R. Glanville (Rokupr), who had been invalided with "blackwater." This survey, short as it was, showed that there was a considerable amount of land in the district under cultivation for rice or suitable for development, and it is essential that conditions in this area should be properly examined. This survey will therefore be continued as soon as an officer is available.

47. *Rice Pests.*—Two important pests of rice made their appearance during the year. The first was "army worms" (*Laphygma exempta*, Walk) and this caused a certain amount of damage to young rice in May. On the whole crops recovered satisfactorily from the damage, and, as the main generation did not lay eggs the pest disappeared with the advent of the heavy rains. A Pentatomid bug which appeared in July was more troublesome. This bug (commonly known as a "Shield" bug) punctures the developing grain and a considerable amount of damage of this nature was reported. Locusts were not a serious pest during 1936.

48. *Oil-palms.*—The work on oil-palms has continued at Njala as will be seen from Appendix VI. The results of these experiments have shown that the most promising oil-palms are those imported from Angola. Over a number of years these have given high yields of good quality fruit, and breeding with the best of the Angola palms as parents has commended. The Deli palms imported from Sumatra have done well but they have not been long enough established to give records warranting their use for breeding purposes.

49. *Coffee.*—Coffee maintains its interest for farmers and 52 plantations comprising in all some 11,350 plants were established. The coffee berry Lycænid (*Deudorix Virachola bimaculata* Hew) was troublesome in Robusta plantings and was also reported on Excelsa and Liberica coffee.

50. *Cocoa.*—The rise in price of cocoa stimulated the interest of growers in the Southern Province. A record export was reached and instructional work and propaganda was carried out in the district

concerned. Cocoa does not grow well all over Sierra Leone but careful study of the crop during the last few years has given an insight into the conditions which are suitable for the cultivation of this crop. We now know where cocoa is likely to prove successful and there appear definite prospects of increasing this crop in certain areas where high bush abounds. As soon as staff is available this problem will be tackled.

51. *Citrus.*—The most important work on citrus was the elimination of scab from the Southern Province. As a result of close inspection of trees, pruning of the less seriously infected and destruction of those badly affected, scab has been reduced to very small proportions in the Province. This treatment will be continued till the Province is clear of scab.

52. *Ginger.*—The ginger crop was slightly above average proportions and efforts were made this year to improve the quality. Only simple methods were adopted. These included the better washing of the ginger and more thorough drying after scraping. This latter point is very important since the drier the ginger the better it keeps and the less the incidence of mildew. Two Agricultural Instructors were detailed for this work and their work in the ginger area had an appreciable effect.

53. Experiments at Njala show that the native method of close planting gives the biggest return per acre of ginger but the cost of seed is an important factor and it would appear that the best profit may come from wider spacing while the question of growing ginger on raised beds must be further considered. This matter is further discussed in Appendix II.

54. *Garden Crops.*—Garden crops are increasing in this Province and it is very noticeable that this increase begins in the region of the departmental farm and spreads outwards. Those stations on the railway serving the area most closely associated with the work of this department (i.e. Mano to Mabang) all show increases in the amount of native foodstuffs (other than rice) railed to local markets. The increase all over the railway system is from 1,902 tons in 1926 to 3,641 in 1936 (1,739 tons) of these increases, 379 tons in 1926 to 2,183 tons in 1936 (1,804 tons) came from the Mano-Mabang area showing that all the increase in production came from this area. Since these native foodstuffs do not figure in the list of " exports " their importance is very apt to be overlooked, but they are in fact of the greatest importance in improving the nutrition and therefore the health of the population. Moreover, the production of these foodstuffs will in course of time liberate rice for export and in any case they form an alternative source of food if the rice crop fails.

55. This aspect of the work of the Agricultural Officer, Southern Province (Mr. J. W. D. Fisher) and the other officers who have worked in the Moyamba District during the last few years cannot be too highly commended. They have introduced into that district the habit of growing a greater diversity of food crops and the native farmer, once he has grown such crops successfully, will continue to do so. It might be thought that the increase of these foodstuffs would decrease rice production in the Moyamba District. Such is not the case. The success

of these crops had led to increased demand for assistance in swamp rice cultivation and towards the end of 1936 arrangements were made with the co-operation of the District Commissioner for this assistance to be given and for suitable seed to be distributed.

56. *Colony Peninsula.*—It is with regret that I have to record that the sickness of Mr. E. S. Garner did not enable this officer to function for more than a comparatively short portion of the year. No officer could be spared to replace him and the work in the Colony Peninsula, and especially on the farm at Newton, suffered in consequence. Nevertheless progress has been made and it is interesting to note that here again the chief progress is in the cultivation of swamp rice in the area from Waterloo to the Ribbi river.

57. Agriculture in the Colony falls naturally into two distinct types—the cultivation of rice in the swamps of the low-lying eastern area (Waterloo—Songo), and the cultivation of fruit and vegetables in the hills of the western area (Waterloo—Freetown). Cassava is grown wherever it will grow in both these areas, if the land is not wanted for other purposes.

58. The development of swamp rice growing in the eastern area between Waterloo and Songo is proceeding steadily—62 farmers were assisted in 1933, a further 103 in 1934, 115 in 1935 and 106 in 1936 making a total of 386, while by the end of 1936 still more farmers had applied for assistance in 1937. G.E.B. 24 was introduced in 1936; it did well and there have been further demands for this variety.

59. The development of fruit, vegetables and other crops for the hilly area is not so simple as the development of rice in the swamp area. In the latter case not only are the farmers keener but we have African Agricultural Instructors who understand the very simple methods by which rice can be cultivated in swamps. We are handicapped, however, by a lack of trained African staff when dealing with other aspects of agriculture which are not so simple as rice growing. We have also much more experimental work to do before we can advise in the cultivation of different varieties of vegetables and fruits with the same confidence that we can in most cases with rice.

60. During 1936 efforts were continued to eliminate scab on citrus and good progress was made. Scab is now reduced to small proportions but inspection and eradicative measures will continue till the disease is overcome.

61. Since the removal of citrus work from Newton to Njala and the discontinuing of work on bananas on dry land soils at Newton, this station has become reduced to a sub-station which in future will be run by an African Instructor under the supervision of an Agricultural Officer. This station is still of use as it affords an excellent centre to work from, on the development of rice growing in the swamps of the eastern area of the peninsula.

62. The bananas grown in the swamp at Newton, which has been drained for this purpose, continue to grow strongly and to bear large bunches. The length of time to come to maturity is much shorter in the swamp than in the dry land above the swamp. In the swamp

the period from the first appearance of the sucker to the harvesting of the bunch is about thirteen months. "Followers" are allowed at intervals of six months or as near as possible so that two bunches a year are obtained from each stool.

63. Trials with pine-apples have been continued at Newton but the conditions there do not appear very suitable for the growth of pines. A great deal of useful planting material has been raised at Newton and this is being distributed to Njala and other departmental stations. There is also a demand for suckers from Colony farmers who, however, appear to think that the size of the fruit depends entirely on variety and very little on care and cultivation.

64. *Sierra Leone Agricultural and Commercial Society.*—The object of the society is to assist production and marketing of agricultural produce. In actual fact its activities are at present limited to the encouragement of fruit and vegetable production in the neighbourhood of Freetown. Its encouragement takes the form of Annual Shows of agricultural produce and during the year it held its Third Annual Show. The exhibits showed an improvement on those of the previous year. Towards the end of the year the society imported and distributed vegetable seeds to market gardeners in the hill villages. It is pleasing to record that owing to the generous support of both the European and African communities the financial position of the society is very satisfactory.

65. *Rice Milling.*—During 1936 a rice mill was erected at Cline Town and was opened by His Excellency the Governor on Saturday, May 2nd, 1936. Although the mill was not opened till late in the rice season 11,823 bushels of rice were milled. The greater part of this was purchased by the department for experimental trials and very interesting results were obtained. The primary object of the mill was to mill rice to a grade suitable for export. It was found that G.E.B. 24 would mill either dry or parboiled to a degree suitable either for local consumption or for export; that Demerara Creole could also be milled dry or parboiled sufficiently well to suit the local market and the Gambia market; that "Toma," the chief grade from Scarcies, could not be milled dry suitably for export, but that after parboiling it would mill satisfactorily both for the local and for the Gambia market. The rice cleaned in the mill sold at a premium of 6*d.* to 1*s.* a bushel over rice cleaned by native methods and it is not unlikely that milling of rice for local consumption will become a necessity in future.

66. The milling of rice in the mill soon disclosed other features, notably the presence of a number of immature grains in early harvests and a high proportion of yellow (and dead) grains in the main crop. The latter were found to be due to stacking the harvested heads before they were properly dry—a bad fault with Scarcies farmers.

67. In spite of the fact that only a small quantity of rice was milled a small profit was actually made, chiefly due to the rise in price of rice between the date the paddy was bought and the date the clean rice was sold (*see* Section III for audited accounts).

68. These preliminary milling trials in 1936 have been very instructive. They reveal the fact that the early cut crops often contain an undue proportion of immature grains while even the late cut crops contain too great a proportion of these. The rice from the Scarcies all contained too many dead grains whose yellow colour spoiled the appearance of the rice. This was more noticeable in rice from the Kasiri that from the Rokupr area. When various grades of milled rice were placed on the market, buyers showed a decided preference for the whiter (cleaner) rices and would pay a premium for them. The ordinary native cleaned rice as put on the market requires further cleaning before it can be consumed and this means further quite appreciable losses on cleaning and labour for cleaning. No one appreciates this more quickly than the ordinary housewife, and rice cleaned in the mill to a degree comparable to that to which the consumer brings native cleaned rice before eating it, always commands a premium. Following the advice of Dr. E. J. Wright of the Medical Department we have not attempted too high a grade of cleaning for the local market as he fears the complete removal of the pericarp, especially in view of low protein and vitamin content of the ordinary diet, would not be beneficial to the health of the people.

SECTION III—FINANCE.

The total provision made by Government for the carrying out of the work of the Agricultural Department (including the Entomological and Mycological sections) was £14,823. This was an increase of £111 when compared with the provision made for the preceding year. Of this amount £11,943 was for Personal Emoluments and £2,880 for Other Charges. When compared with 1935, the provision for Other Charges shows a decrease of £437, but this decrease was due to the transference of the sum of £513 for passages from the Agricultural vote to Miscellaneous Services. Allowing for this transference there was an increase of £76 in " Other Charges " and an increase of £624 in the total provision made. In addition to this provision, assistance amounting to £3,558 10*s.* 4*d.* was received from the Colonial Development Fund during the year for the development of rice growing in the Scarcies area.

2. The total actual expenditure from departmental votes was £14,387 14*s.* 0*d.* made up as follows :—

	£	*s.*	*d.*
Salaries	11,370	16	4
Duty allowance	148	9	4
Acting allowance	15	16	5
Seniority pay	273	4	6
Allowance in lieu of quarters	2	10	0
Total Personal Emoluments	11,810	16	7
,, Other Charges	2,576	17	5
Total from departmental vote	14,387	14	0
,, Colonial Development Fund ..	3,558	10	4
Total from all sources	£17,946	4	4

3. The cost of each division of the department was as follows :—

—	Salaries.	Duty Allowance.	Seniority Pay.	Acting Allowance.	Allowance in lieu of Quarters.	Other Charges.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Headquarters	1,844 10 5	148 9 4	—	15 16 5	—	206 10 11	2,215 7 1
Southern Province (including Njala)	3,049 3 6	—	83 16 2	—	—	967 4 6	4,100 4 2
Northern Province (including Rokupr)	1,856 11 0	—	67 3 2	—	2 10 0	681 13 10	2,607 18 0
Colony (including Newton) ..	822 7 6	—	—	—	—	305 12 9	1,128 0 3
Produce Inspection	1,650 17 11	—	—	—	—	345 18 3	1,996 16 2
Research	2,147 6 0	—	122 5 2	—	—	69 17 2	2,339 8 4
£	11,370 16 4	148 9 4	273 4 6	15 16 5	2 10 0	2,576 17 5	14,387 14 0

4. *Rice Development Scheme.*—Early in 1935 the Colonial Development Fund Committee made a free grant of £4,650 to Government for the development of the rice industry of this country. That year only £1,271 14*s.* 2*d.* of the grant was disbursed partly on buildings and stores, etc. and partly on the salary of the Agricultural Officer specially engaged for rice breeding work. During 1936, the balance of the grant was completely exhausted and the work for which the money was granted was completed. This work included the erection of a 3 cone rice mill, buildings to house the mill, rice stores at Freetown and at Rokupr, drying grounds at both places, etc. The actual amount expended on these works during the year amounted to £3,558 10*s.* 4*d.*, which when added to the previous year's expenditure (£1,271 14*s.* 2*d.*) shows an increase of £180 4*s.* 6*d.* on the Colonial Development Fund grant (£4,650). This increase was met from a vote by Government.

5. *Rice Suspense Account.*—As a result of the erection of the mill a Rice Suspense Account was opened by Government with the approval of the Secretary of State for the Colonies. During the year the mill purchased 7,904 bushels paddy at £900 5*s.* 5*d.* which after milling was sold for £1,080 4*s.* 6*d.* The mill also cleaned rice for private individuals and from this £68 2*s.* 11*d.* was realised. At the end of the year the audited account showed a profit of £46 19*s.* 1*d.* arrived at as follows :—

Receipts.

	£	s.	d.	£	s.	d.
Sale of rice	1,080	4	6			
Sale of bags	4	7	4			
Milling receipts	68	2	11			
Stock in hand	24	0	0			
				1,176	14	9

Expenditure.

Rice purchased	900	5	5		
Bags purchased ..	55	14	8		
Millhands and labour ..	95	17	3		
Overtime to millhands and labour	0	16	5		
Tools, appliances, etc. ..	10	14	1		
Oil, grease, etc.	3	6	8		
Transport	0	17	6		
Electric Light and Power ..	63	3	8		
				1,129	15	8
Profit ..				£46	19	1

This profit was credited to general revenue at the close of the year.

6. *Beeswax Suspense Account.*—The amount realised from the sale of wax was £289 2*s.* 2*d.* as compared with £182 9*s.* 5*d.* in the previous year. The amount expended on purchase, clarification, packing, freight, etc. of the wax was £210 7*s.* 4*d.*; leaving a profit of £78 14*s.* 10*d.* This profit was also credited to general revenue.

7. The revenue of the department amounted to £1,788 11*s.* 10*d.* or an increase of £401 14*s.* 7*d.* when compared with the revenue earned during the previous year. This figure represents an all-round increase on the various items with the exception of "Sales—Newton Fruit Farm," which shows a decrease of £5 3*s.* 1*d.* when compared with receipts for the previous year. The particulars of revenue collected are as follows:—

	£ s. d.	£ s. d.
III—Licences:		
Produce	1,323 15 0	
Fines for contravention of the Native Produce Ordinance	169 19 6	
Departmental fines ..	3 3 1	
		1,496 17 7
V—Fees of Court or Office:		
Receipts, Newton Fruit Farm	33 13 11	
Sales, Produce	126 5 0	
		159 18 11
IX—Miscellaneous Receipts:		
Sale of old stores and sundries	6 1 5	
Other Miscellaneous Receipts;		
Profits—Beeswax Suspense Account	78 14 10	
Profits—Rice Suspense Account	49 19 1	
		131 15 4
		£1,788 11 10

8. The following is a comparative statement of the revenue collected during this and the previous year :—

COMPARATIVE STATEMENT OF REVENUE.

——	1935.	1936.	Increase.	Decrease.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Produce Licences	1,106 14 0	1,323 15 0	217 1 0	—
Fines for Contravention of Native Produce Ordinance	91 2 6	169 19 6	78 17 0	—
Departmental Fines	2 2 9	3 3 1	1 0 4	—
Receipts—Newton Fruit Farm	38 17 0	33 13 11	—	5 3 1
Sales—Produce	113 15 4	126 5 0	12 9 8	—
Sales—Old stores	5 15 3	6 1 5	0 6 2	—
Profits.				
Beeswax	28 10 5	78 14 10	50 4 5	—
Rice Mill	—	46 19 1	46 19 1	—
	1,386 17 3	1,788 11 10	406 17 8	5 3 1

Total increase	£406 17 8
Total decrease	5 3 1
Net increase	£401 14 7

SECTION IV—LEGISLATIVE CHANGES.

The following legislation dealing with agricultural matters was enacted during the period under report :—

The Native Produce (Amendment) Ordinance, No. 1 of 1936. This amending Ordinance enables the Governor in Council to make rules prescribing the manner in which buildings for storing produce intended for sale shall be constructed and the manner in which such produce shall be stored.

The Plant Pests (Import) Order in Council, No. 5 of 1936 : under the Destructive Pests Ordinance, 1924. This Order controls the imports of planting material into Sierra Leone, and revokes certain subsidiary legislation now covered by this Order.

The Native Produce (Storage of Rice) Rules, 1936. These Rules were made under the Native Produce Ordinance, 1928 and prescribed the manner in which rice may be stored ; they apply only to traders storing rice in quantity and not to petty traders or native producers.

F. J. MARTIN,
Director of Agriculture.

APPENDIX I.

ROKUPR EXPERIMENTAL RICE STATION

by

Agricultural Officer, Northern Province.

Mr. R. R. Glanville was in charge until he was invalided in early December when the writer took over. Mr. A. F. Mackenzie was stationed at Rokupr throughout the year; and, although assisting generally, concentrated on the experimental work including the layout and statistical analyses of experiments.

The progress made in the various activities of the station is very satisfactory. Close contact has been established with River farmers; they show great interest in the work being done, are very willing to give the department's recommendations a trial and give valuable criticisms of new varieties and methods. The station proves itself eminently suited, as regards site and soil, to elucidate the problems which prompted its origin.

An additional 15 acres of upland has been leased to provide additional land for nursery work, a reservation area for the new bungalow and a site for a cattle steading.

The small area under *upland crops* was maintained and crops of interest to local farmers grown for demonstration purposes and to provide planting material for distribution. These include, citrus, oil-palm, coffee, cassava, sweet potato, Kono ground-nuts, ginger, pine-apple, peppers and miscellaneous fruits and vegetables.

Weather conditions were not as favourable as in 1935, rains and flooding persisted longer than usual. This is reflected in slightly lower yields.

NURSERIES.

Fertility was aided by the addition of ashes, and, after removal of the rice seedlings, green manure crops, including sunn hemp, cowpea, centrosema pubescens, pueraria, and green gram were grown. Mixtures of green gram and pueraria, and green gram and centrosema were tried with success, the green gram checking weed growth till the main cover was established. A common seed rate of 200 lb. per acre was used.

"Army Worms" made their first serious appearance and early sown rices, including Kavunginpoothala, Baitel Fakir and Panianala, received a check, but spraying with kerosene emulsion proved a successful control measure. Although eaten close to the ground, the rices recovered well.

Piricularia oryzæ was again extremely severe in the nurseries. The earlier sown rices recovered but late sowings of G.E.B. 24, Co. 7, etc. were almost completely useless. Fortunately the disease did not persist to a serious extent after transplanting. Unless an efficient and practical seed treatment can be devised which will eliminate or considerably lesson the incidence of this disease, it will be advisable to try and isolate immune or resistant strains.

FARM.

Cultivation.—As in previous years, the plots were prepared by deep-hoeing in the dry season followed by light digging and a certain amount of levelling and puddling before transplanting was done.

The original bunds were maintained and three new cross ditches were dug to facilitate drainage after high tides. For various reasons it is not yet possible to have good water control. Innumerable breaches made by crabs and damage by flood water at high tide make it very difficult to retain water on blocks even between tides.

PESTS AND DISEASES.

Crabs are a serious pest and, in addition to damaging bunds, they did considerable damage to rice plants. Fortunately, by using wide borders in experimental blocks this error can be minimised. Rats were again troublesome on the plots adjoining the upland area and boys had to be employed to scare birds and monkeys. Insects did little damage.

Helminthosporium and *Piricularia oryzæ* were present but only to a serious extent on the plot of Bali. Kavunginpoothala showed some physiological disease in its early growth, the chief symptom being chlorosis, but it recovered well.

PURE-LINE SELECTIONS.

Work was continued on the lines of previous years, the chief objects being to eliminate red grains and to obtain higher yielding strains. Lal, a local long duration rice was subjected to first year single plant selections.

Bis and India, both local rices were subjected to second year family selection. Of 51 selections of India, 6 were retained on their flowering charts, and of 34 Bis selections 8 families were retained.

Selections of three varieties, D.C., Toma and Fodea retained from the previous year were subjected to comparative yield trials. The control in each case was the bulk local seed raised from the first selections made. The layout in each case was a Latin square using the selections plus control as variants. Seedlings were planted singly at 6″ x 6″ the whole trial being designed to give reliable data for analysis. Before any multiplication or distribution is attempted, strains will be subjected to a further comparative yield trial next year.

Full details of methods adopted are contained in the annual report for 1935.

COMPARATIVE YIELD TRIAL.

I. *Variety*—Toma.

Three strains and Control, the control being the original stock containing much red grains and the strains white grained selections.

Layout: Latin square 4 x 4. Plot size 20′ x 20′ planted singly at 6″ x 6″.

Strains.	Yield per acre/lb.	Per Cent. of Control.
C	1,997	100
55	1,859	93
54	1,833	91·8
57	1,716	85·9

Standard error as per cent. of General Mean—12·16.

Statistical Note.—There is no significant difference between the yields of the various strains.

II. *Variety*—Fodea.

Six strains and Control.

Layout: Latin square 7 x 7. Plot size 12′ x 12′ planted singly 6″ x 6″.

Strains.	Yield lb./acre.	Percentage of Control.
142	1,716	105
143	1,646	100·2
151	1,646	100·2
C	1,642	100·0
152	1,623	98·8
126	1,585	96·5
131	1,450	88·3

Standard error as percentage of General Mean—7·67 per cent.

Statistical Note.— Any difference of 164 in yields in column 2 may be regarded as significant.

Strains 131 is the only strain significantly different from the Control.

III. *Variety:* D.C. (Sierra Leone)

Six strains and Control.

Layout: Latin square 7 x 7. Plot size 12′ x 12′ planted singly at 6″ x 6″.

Strains.	Yield lb./acre.	Percentage of Control.
39	1,510	105·2
5	1,497	104·3
42	1,475	102·8
6	1,440	100·2
C	1,436	100·0
4	1,433	99·8
44	1,417	98·7

Standard error as percentage of General Mean—9·01 per cent.

The trials show that objectionable characters such as red grains and un-uniformity can be, and have been, eliminated without reducing yield. Further selections will be made with the object of increasing yields, and comparison of the pure types used above with the average seed now used by native farmers will be made.

CULTIVATION EXPERIMENTS.

Seed rate and time in Nursery.—A trial with G.E.B. 24 rice was carried out to determine the optimum seed rate and length of time required in the nursery. The layout consisted of randomized blocks replicated six times. The treatments were:—

Seed Rates in Nursery.	Time in Nursery.
100 lb. per acre	4 weeks
200 ,, ...	6 ,,
300 ,, ...	8 ,,
400 ,, ...	10 ,,
	12 ,,

Single planting was done at 6″ x 6″ spacing.

In the nursery the four seed rate variants were arranged in the form of a Latin square, 4 x 4. This was done to reduce possible errors due to lack of soil uniformity in dry land nurseries.

SEED RICE.

Seed Rates in Nursery.	Yield lb./acre.
100 lb./acre	1,978
200 ,, ...	1,959
300 ,, ...	1,881
400 ,, ...	1,805

Statistical Note.—A difference of 50 is significant in column 2.

Time in Nursery.	Yield lb./acre.
4 weeks	1,995
6 ,, ...	2,165
8 ,, ...	2,305
10 ,, ...	1,894
12 ,, ...	1,261

Statistical Note.—A difference of 135 is significant in column 2.

Standard error as a percentage of the General Mean—8·9.

INTERACTION OF SEED RATE AND TIME IN NURSERY.

Figures given are mean yields in lb./acre.

Time.	Seed Rate 100	200	300	400
4 weeks	1,842	2,159	1,901	1,919
6 ,, ...	2,163	2,216	2,161	2,018
8 ,, ...	2,428	2,432	2,212	2,148
10 ,, ...	2,110	1,777	1,743	1,847
12 ,, ...	1,350	1,213	1,388	1,092

Statistical Note.—The interaction between the seed rate and the time in nursery is statistically significant.

The conclusions drawn from the above experiment are—

(*a*) A seed rate of 100 or 200 lb./acre will give a higher yield than seed rates in excess of 200 lb./acre, other things being equal.

(*b*) The optimum time in the nursery (under the conditions of the experiment) is eight weeks, a longer or shorter period will lower the yield significantly.

(*c*) The combined effect of a low seed rate and optimum time in the nursery of eight weeks is greater than the sum of the effects of these two factors.

Spacing and number of plants per stand.

Last year a trial was carried out to determine what spacing gave the biggest yield per acre with G.E.B. 24. It was found that the closest spacing (6″ x 6″) gave the biggest yield. In 1936 still closer planting was tried and rice was transplanted 4″ x 4″ with 1 and 3 plants per stand. The control spacing was 6″ x 6″ with 3 plants per stand.

The layout was a randomized block replicated four times.

Treatments.	Yield lb./acre.	Percentage of Control.
3 plants at 4″ x 4″	1,867	119·3
1 „ „	1,786	114
3 „ 6″ x 6″	1,565	100

Standard error as percentage of General Mean—5·1 per cent.

Statistical Note.—A difference of 193 in column 2 is significant.

It is evident that planting at 4″ x 4″ will give an appreciable increase in yield over planting 3 plants at 6″ x 6″.

Combining last year's figures with those obtained this year we get the following very interesting results. The spacing 9″ x 9″ with 3 plants as a stand being taken as 100.

Planting Distances.	A. Percentage of Yield.	B. Number of Plants per square foot.	A/B. Comparative Yield per Plant.
3 at 4″ x 4″ ..	168	27	6·22
1 „ 4″ x 4″ ..	160	9	18
5 „ 6″ x 6″ ..	149	20	7·5
3 „ 6″ x 6″ ..	140	12	11·7
1 „ 6″ x 6″ ..	134	4	33·5
5 „ 9″ x 9″ ..	100	9	11
3 „ 9″ x 9″ ..	100	5	20
1 „ 9″ x 9″ ..	68	2	34
5 „ 12″ x 12″ ..	70	5	14
3 „ 12″ x 12″ ..	55	3	18·3
1 „ 12″ x 12″ ..	30	1	30

From the above it would appear that as far as transplanting single plant stands of G.E.B. 24 are concerned, no reduction in yield per plant is incurred until distances decrease below 6″ x 6″ ; there is a big decrease per plant when this spacing is reduced to 4″ x 4″. When seedlings are transplanted three to a stand there is no reduction in yield per plant until the spacing decreases below 9″ x 9″ : a reduction to 6″ x 6″ shows a big fall in the yield per plant.

The question as to which spacing is the better economic proposition is not yet clear and requires further consideration. In this connexion it must be remembered that the amount of seed available is just as often the limiting factor as the area of land. It would appear, however, that for single planting 6" x 6" is the limit of practical value, but that for three plants per stand the question of whether the amount of land or seed is the limiting factor is probably the deciding factor. Spacing wider than 9" x 9" does not appear profitable and with this limitation of space it does not pay to plant more than three plants per stand.

Soil Uniformity Tests.—Only one plot was tested as the suitability of most plots has already been determined in this way.

Maintenance of Varieties.—Twenty-four introduced and important local varieties were grown in separate maintenance plots. The object of doing this is to maintain the purity of introduced varieties, to maintain controls for comparative trials against selections from local varieties, and to provide material for observations.

New Introductions.—Four varieties, Sughandi A 28/8, Emata A 16/34, Nhasein C 19/26 and Midon D 17/88 were introduced from Burma, Midon, a barley type promises well, in fact all varieties are well worth further trial as they were received late for sowing and, despite this, did well. Mo-Kuk, a salt tolerating variety obtained from Hong Kong, was also received late. It was not too promising but will be tried again under better conditions. It appeared to be impure and awned types were common.

General Multiplication.—Fully 6 acres of G.E.B. 24 was grown to maintain a pure supply of seed and to assist in meeting the demand for seed. 1½ acres of Kavunginpoothala, and 1 acre each of Co. 7, Bali and No. 79 were grown for similar reasons.

The following list shows all introduced varieties grown and the quantity of seed available from Farm produce :—

(The produce from experimental work is not included).

Variety.	Type.	Origin.	Seed in lb.
Bali	.. Salt resisting ..	Madras, 1931 ..	615
Mo-Kuk	.. ,, ,, ..	Hong Kong, 1936	60
Indo China ..	Deep-water, floating	Fr. Guinea, 1928	7
Kar	Deep-water erect ..	Madras, 1931 ..	8
Panianala	.. ,, ,, ..	,, ,, ..	482
Baitel Fakir ..	.. ,, ,, ..	,, ,, ..	418
Kavunginpoothala ..	.. ,, ,, ..	,, ,, ..	1,610
Co. 5	.. Long duration ..	,, ,, ..	674
Co. 7	.. ,, ,, ..	,, ,, ..	1,550
G.E.B. 24 ..	.. Medium duration ..	,, ,, ..	3,527
Blue Stick ..	.. ,, ,, ..	Br. Guiana, 1934	232
No. 79	.. ,, ,, ..	,, ,,	562
D.C.	.. ,, ,, ..	,, ,,	235
Lead Rice	.. ,, ,, ..	,, ,,	319
Midon	.. ,, ,, ..	Burma, 1936 ..	70
Ngasein	.. ,, ,, ..	,, ,, ..	11
Sughandi	.. ,, ,, ..	,, ,, ..	13
Emata	.. ,, ,, ..	,, ,, ..	13

The following local rices were also grown and seed is available :—

D.C., Lal, India, Fodea, D.C. pa lil, Kindi, Bis, Yarat, Bathurst, Toma and Bolo.

It is not possible to give the total yield from the Farm at present as the threshing of experimental and pure-line plots has not been completed.

G.E.B. 24 continues to be a very popular and successful variety under widely varying conditions. 339 farmers in the Scarcies area were supplied with seed during the past year and it is estimated that at least 1,500 bushels of good seed will be available for distribution during the coming season to new farmers. In addition, there is certain to be a wide circulation amongst families and relations. It will, however, be necessary to maintain a supply of pure seed.

Kavunginpoothala threatens to run G.E.B. 24 very close as a first favourite and is almost certain to supplant it in the deeper flooded swamps.

Other varieties which have their advocates amongst farmers and promise very well are Co. 7, No. 79, and Lead Rice.

Bali was given to four farmers in the salt area but results are unreliable and disappointing. A small abandoned farm has been selected in the salt area and Bali and Mo-Kuk, using local rices as controls, will be tested out by the department during next season. Various methods of cultivation will be carried out early in the year to assist the removal of salt as soon as the rains begin.

G. M. RODDAN,
Agricultural Officer, Northern Province.

APPENDIX II.

NJALA AGRICULTURAL STATION

by

Agricultural Officer, Southern Province.

The Agricultural Officer stationed at Njala deals mainly with investigations connected with the improvement of upland farming. At present the only method employed by native farmers is that of shifting cultivation and the land in the main is cultivated for one year only before it is allowed to revert to bush. In the northern (and drier) parts of the country, land is sometimes cultivated for two years running, but never for two consecutive crops of rice.

MAINTENANCE OF FERTILITY BY MEANS OTHER THAN BUSH REGENERATION.

2. The maintenance of fertility by bush regeneration takes a minimum of from eight to ten years. To shorten this period leads to progressive infertility; to maintain this period limits the amount of land available for cultivation. With the settled conditions now prevailing in the Protectorate and the increasing population, there is an increasing demand for land. This is leading towards a decrease in the period of bush regeneration and the lowering of the fertility of the land. Experimental plots are therefore being cultivated to determine whether any system of permanent cultivation can be found which can be substituted for the present system. Owing to the heavy rainfall and the consequent quick removal of plant food during cultivation, each rice crop (the main food crop of the inhabitants) must be followed by a crop or a series of crops which will replace in the soil those elements removed during the cultivation of the rice crop. It would appear that in the absence of any form of animal husbandry this can only be accomplished by the growing of green manures. Various of these green crops have been tried and the best is that provided by *Calopogonium muconoides*. This crop will grow with little attention for three or four years and would probably provide enough plant material to maintain fertility in two or three years. It has however been shown in other colonies that it is extremely difficult, in fact generally impossible, to get natives to grow green manure crops which provide food for neither man nor beast and Calopogonium unfortunately does neither. Crops which would provide either food or fodder have therefore been looked for and two crops which appear possible are pigeon peas and *Centrosema pubescens;* the former provides both a heavy cover crop and food—in the form of edible peas; and the latter provides a cover crop which can be fed to sheep.

FERTILITY EXPERIMENTS WITH PIGEON PEAS.

These experiments are designed to see if pigeon pea grown after rice will restore fertility to the soil; and if so for how long the crop must be grown for that purpose. The experiments are planned in a manner allowing statistical treatment and the rice crops will be taken after one, two, three and four years of pigeon pea. During 1936 all plots were under pigeon pea which established itself readily and appeared to form a good cover.

FERTILITY EXPERIMENTS WITH CENTROSEMA.

Centrosema plumieri was tried as a cover but it proved a slow starter and during the year a supply of *Centrosema pubescens* was obtained for planting in 1937.

YIELDS OF DIFFERENT VARIETIES OF CASSAVA.

The object of this trial was to obtain yield and maturation data for the five common varieties:—Mayugbe, Kande, Kono, Two cent. and white.

Lay-out.—Cuttings were planted at 3′ interval on ridges 3′ apart.

The varieties were planted in single rows so that each variety occurred every fifth row across the plots. The trial occupied approximately two acres and there were 24 rows of each variety. The cassava was planted at the end of June and sections were harvested after 6, 9, 12 and 15 months.

The average yield per plant at each harvest was:—

Variety.	6 months lb.	oz.	9 months lb.	oz.	12 months lb.	oz.	15 months lb.	oz.
Mayugbe	2	13	2	7	3	14	8	3
Kande	3	0	4	3	4	15	7	3
Kono	—	—	—	—	3	8	6	0
Two Cent	2	3	2	4	3	12	5	4
White	—	—	—	—	2	2	2	15

The 9 months harvest took place towards the end of the dry season ; it showed little increase on the 6 months yield. Of the varieties tested, Mayugbe and Kande (sweet and bitter varieties respectively) are the heaviest yielders ; and of the periods tested 15 months gave the best yield in quantity and quality.

GINGER.

Method of Cultivation Trial.—This experiment was designed to investigate yields and comparative profits by different methods of sowing at varying spacings.

Lay-out.—A 7 x 7 Latin square on an acre.

Methods under Investigation.—

A. Native Method—close planting ; this worked out at 26·3 sets per square yard.

B. On flat 9″ x 9″—16 sets per square yard.

C. On flat 12″ x 12″—9 sets per square yard.

D. On ridges 18″ x 9″—8 sets per square yard.

E. On ridges 18″ x 12″—6 sets per square yard.

F. On ridges 18″ x 6″—12 sets per square yard.

G. Native method (close planting) on raised beds, this planting worked out at 18·2 sets to the square yard.

The following planting figures are of interest :—

Method.	Number of Sets per section.	Average weight of Seeds per section, lb.	Weight required to plant one acre, lb.
A	2,500	50·0	2,450
B	1,521	27·75	1,360
C	841	15·5	760
D	780	14·5	710
E	580	10·6	520
F	1,180	22·75	1,115
G	1,800	32·5	1,593

The ginger was harvested in January. Large hands were selected and weighed separately from the main bulk, which was also weighed. It is assumed that the best method of cultivation is that which will give the largest profit per acre, since differences in the labour costs for different distances of planting are small.

The yields from the plots were as follows :—

Method.	Yields of Individual Plots, lb.							Mean.	Total.
A ..	117	157	191	154	161	194	187	166	1,161
B ..	138	134	96	97	130	143	138	125	816
C ..	122	42	160	85	106	77	94	98	686
D ..	42	96	74	113	76	86	126	88	613
E ..	58	37	79	65	56	57	99	64	451
F ..	58	110	100	71	80	124	151	99	694
G ..	153	190	200	172	204	174	197	184	1,290

The standard error was found to be 155 and the "Z" test was satisfied. Differences greater than three times the standard error can therefore be taken as significant.

Summarising :—

Method.	Total Yield.	Percentage of Mean.
A—Native method	1,161	141
B—9″ x 9″	876	106
C—12″ x 12″	686	83
D—18″ x 9″	613	74
E—18 x 12″	451	55
F—18″ x 6″	694	84
G—On raised beds	1,290	157
Mean	824	100
Standard error	155	18.8

From the above we find—

(i) there is no significant difference in total yield between ginger on the flat and on raised beds.

(ii) both A and G give yields significantly higher than C, D, E and F.

The next point to examine is the return to the grower from each of the methods employed, for although the yields may be greatest from the closer methods of planting, yet the cost of seed is so high that a careful analysis of yields and costs must be made.

WEIGHTS OF SEED USED AND GINGER HARVESTED.

Method.	Weight of Seed per acre, lb. (undried).	Yield per acre, lb. (undried).	Yield per acre, lb. (dry).
A—Native method close planting ..	2,450	8,127	1,625
B—9″ x 9″ ..	1,360	6,132	1,226
C—12″ x 12″ ..	760	4,816	963
D—18″ x 9″ ..	710	4,291	858
E—18″ x 12″ ..	520	3,157	631
F—18″ x 6″ ..	1,115	4,858	972
G—On raised beds, close planting ..	1,593	9,030	1,806

Assuming that the value of seed ginger is 1½*d.* a lb. and the value of dry cleaned ginger 3½*d.* a lb. (values early in 1937), the following figures are obtained:—

Method and Spacing.	Cost of Seed per acre.	Value of Ginger Crop per acre.	Profit per acre.
	£ s. d.	£ s. d.	£ s. d.
A—Native Method (6·75″ x 6·75″) ..	15 6 3	23 13 11	8 7 8
B—9″ x 9″ flat ..	8 10 0	17 17 7	9 7 7
C—12″ x 12″ flat ..	4 15 0	14 0 10	9 5 10
D—18″ x 9″ ridge ..	4 8 9	12 3 5	7 14 8
E—18″ x 12″ ridge ..	3 5 0	9 4 5	5 19 5
F—18″ x 6″ ridge ..	6 19 5	14 3 6	7 4 1
G—On raised beds 8·5″ x 8·5″ ..	9 19 1	26 6 9	16 7 8

From the above it is obvious that total yields bear no relation to profit. The native method of close planting gave much larger yields than the wider methods of planting, but the cost of the seed in close planting is so high that the profit from the wider spacings B and C were a little higher in spite of the lower yield; and that without involving so much capital outlay. The return from raised beds is the highest and this is very interesting as the only difference in cost of cultivation is the additional cost of making the beds after the land has been dug over. The cost is estimated at no more than £1 per acre and natives are accustomed to making raised beds for sweet potatoes.

Another point of interest is the return per unit of seed used. These work out as follows :—

——	Number of Plants to square yard.	Yield—as number of times the weight of Seed used.
A—Native method ..	26·3	3·3
B—Spacing 9″ x 9″ ..	16·0	4·5
C— ,, 12″ x 12″ ..	9·0	6·3
D— ,, 18″ x 9″ ..	8·0	6·0
E— ,, 18″ x 12″ ..	6·0	6·1
F— ,, 18″ x 6″ ..	12·0	4·3
G—Raised beds methods	18·2	5·7

It would appear that the return per unit of seed used increases with increased spacing up to 12″ x 12″ on the flat. Comparing G (raised beds) with B (flat) the return per unit of seed appears to higher on raised beds than on the flat.

These trials can only be regarded as preliminary and further experiments will be carried out with regard to spacing both on the flat and on raised beds.

GRAPEFRUIT COLOURING EXPERIMENTS.

Ethylene was used throughout and the following methods which are apparently used in the countries indicated were tried :—

(*a*) *Porto Rico.*—Ethylene 1 : 3,000 ; doses repeated at two hour intervals with ventilation between doses.

(*b*) *South Africa.*—Ethylene 1 : 5,000—1 : 20,000 ; ventilate when CO_2 concentration reaches 1 per cent.

(*c*) *California.*—Ethylene 1 : 10,000 ventilating when CO_2 concentration reaches 1 per cent.

(*d*) *Jamaica.*—Ethylene 1 : 6,000 in 2 doses for 36–48 hours with good ventilation between doses.

(*e*) *Method suggested by makers of Ethylene.*—Ethylene 1 : 1,000. 2 or 3 injections per day in fairly gas tight room.

(*f*) *Continuous method.*—A continuous stream of ethylene with continuous ventilation.

Uncoloured boxes were kept as controls in each experiment. Fruit was harvested early in the morning. Temperature and humidity records for the colouring room were kept for each experiment, a self-recording thermo-hygrograph being used.

Results over one season are not strictly conclusive, but as far as possible, experiments were repeated to confirm findings. The aim was to find the best method from the following points of view :—

(i) Control of stem-end rot.

(ii) Convenient and quick colouring.

(iii) Economy of ethylene.

Findings to date indicate that :—

(i) High concentration of ethylene results in an increase in the number of rots.

(ii) Short period applications of high concentration require more gas than long period applications of low concentration for efficient colouring. It was found that buttons were more difficult to remove after 5 short period doses of 1 : 3,000 than 3 long period doses of 1 : 10,000.

(iii) Removal of the buttons immediately after colouring reduced the stem-end rot by over 75 per cent., the number of rotted fruits out of nearly 9,000 debuttoned grapefruits was well under 1 per cent.

(iv) Colouring continues rapidly for about 48 hours after removal of the fruit from the colouring room.

(v) As is to be expected, the number of doses required for good colouring varies with the state of ripeness of the fruit.

The method recommended and now adopted is to use a 1 : 10,000 concentration for 8—12 hours with ventilation between doses. At the beginning of the season 3 to 4 doses were required for colouring and the easy removal of buttons, but towards the end of the season 2 doses were sufficient. Buttons should be removed immediately after the fruit is taken from the colouring room.

Long Storage of Grapefruit.—Prime fruit picked on 6th December, 1935, were coloured and debuttoned ; one lot packed in sand and the other in sawdust. The sand and sawdust were kept moistened. After 3 months, the number of rots in sawdust was 5 (out of 125 fruits) and in sand 15 (out of 135 fruits). The fruit appeared as fresh and firm as the day it was picked. This appears to be a promising method of storing fruit.

OIL-PALMS.

Work on the oil-palm plantations in collaboration with the Plant Pathologist was continued. The yields from the established plots and the Plant Pathologist's comments are recorded in Tables A to N of Appendix VI.

A study of the yields over a period of years showed that certain of the Angola oil-palms had not only given the highest yields but also the best type of fruit. It was therefore decided to use the best Angola trees as parent palms and breed from them. Difficulties were found in that the palms often did not bear male and female inflorescences at the same time. Pollen was therefore collected from the male inflorescences and stored until the female inflorescences opened their stigmas. The palms were then artificially self-pollinated. Fruits thus produced were harvested and have been sown in nurseries. These have germinated and will be planted out in due course.

COFFEE.

The existing plantations under natural shade were maintained. The Robusta coffee planted in 1934 gave a satisfactory yield and the Excelsa planted under the same conditions at the same time gave a small yield but appears to be growing strongly.

Shade for Coffee.—Coffee is being grown under planted shade with various kinds of shade trees. Up to the present one of the more promising temporary shade trees is *Cassia siamea.*

Vegetative reproduction.—Preliminary work with grafting Stenophylla and Robusta on to Liberica has been started. Grafts have been made successfully but not sufficient staff has been available to enable this work to reach proportions suitable for field trials. Individual yields are being taken of all coffee trees on the station so that the best material for grafting will be readily available.

PINE-APPLES.

Varietal and propagation studies have been continued and planting material multiplied with a view to carrying out plot trials.

BLACK PEPPER.

A second plot of half an acre was planted with live " plum " stakes as support. They grew moderately well but suffered when the dry season set in through insufficient shade. The plants established under rubber are growing fairly satisfactorily.

CINNAMON.

An acre of this crop was planted. Seedlings did not transplant well and crickets were responsible for further heavy losses.

CASHEW.

Seedlings have been raised for distribution.

MANGO AND AVOCADO.

Old trees have been top-worked and supplies of grafted plants are available for distribution.

POULTRY.

Work on poultry has been continued with Rhode Island Red fowls on the lines of the past two years. The stock did not come through the last wet season any too well. The chief cause of rather heavy losses amongst chicks was white diarrhœa and internal parasites, the latter also affecting the older fowls. A fresh importation of cockerels from England was made in June. Breeding-pens were carefully re-selected and since then there has been a marked improvement in the vitality of the stock. A number of portable fowl-houses have been made on the station and the usefulness of these is already apparent. The young birds on free-range are healthier and have grown faster. It is hoped that this system of rearing will greatly reduce the losses from internal parasites. Seven days appears to be the maximum time up to which hatching-eggs should be kept before setting for incubation. For this reason small (50 or 60 egg) incubators, one of which has been successfully used here, are recommended for ordinary purposes on agricultural stations.

J. W. D. FISHER,
Agricultural Officer, Southern Province.

APPENDIX III.

PRODUCE INSPECTION.

Palm Kernels.—The optimistic outlook mentioned in last year's annual report has been amply justified during 1936. Prices were higher than in the previous year and native collectors and dealers alike derived greater benefits from resultant trade than has been experienced for the past few years

During the first half of the year buying prices fluctuated between £6 to £8 per ton at Freetown ; in the latter half, especially within the last quarter, from £8 to £10, and in December the price rose to £13 5*s*. 0*d*.

Inspection up-country and at the ports has been consistently maintained, despite unforeseen circumstances which at times have necessitated the work being carried out with reduced personnel. It is a pleasure to report, that merchants have given whole-hearted support to the work of Produce Inspection throughout the year in all centres, thereby considerably assisting our efforts to maintain a suitable standard of purity.

Railment and export figures for kernels provide interesting reading, they show that both railments and exports reached a record in 1936. Comparison with the past five years are as follows :—

——	Railments, Tons.	Exports, Tons.
1932	41,960	77,162
1933	33,294	64,084
1934	33,925	68,655
1935	43,106	78,019
1936	44,416	84,578

Though the bulk of exports are made from the principal port of Freetown, Bonthe and Sulima have also contributed towards the achievement of this record.

——	Bonthe, Tons.	Sulima, Tons.
1932	23,870	325
1933	19,556	355
1934	21,547	560
1935	22,797	746
1936	26,354	861

Palm-Oil.—Railment and export figures both reveal a decrease when compared with similar figures for the previous year ; this however, is not necessarily to be interpreted as a falling off in production. The main cause for decline in exports is that producers have diverted their attention to supplying the increasing needs for home consumption which has arisen through the recent mining developments and the diversion of much labour from agriculture to mining. Formerly most consumers produced their own oil and still had a surplus which was sold eventually for export, this surplus is now in part absorbed by various mining communities. Further, better prices are obtained for edible oil, and the edible oil market is therefore more attractive than the export market.

The standard of purity prescribed for export was maintained throughout the year and no cases of adulteration were reported.

Piassava.—Exports for the year amounted to 3,588 tons : of this, 2,482 tons were exported from Sulima, 278 tons from Mano Salija, and the remaining 798 tons is comprised of shipments from Bonthe, Sherbro, and transhipments from Freetown coming originally from Bonthe.

Though the quality of material shipped from Sherbro has been equal to that of former years, there was evidence that producers were declining in their care of selection of material and preparation for the market. Petty dealers who were willing to deal in poorly prepared fibre were also noticeably increasing in numbers. The result of these two factors working together, made it increasingly difficult for the larger exporters to obtain at first hand, the type and quality of piassava known as " Prime Sherbro Piassava."

In order to avoid any falling off in quality an Agricultural Instructor of some years experience was given the power of a Sub-Inspector of Plants and Produce and posted in November, 1935 to patrol the Sherbro area. As an Instructor, his services are at the disposal of producers who express a willingness towards improving their methods of preparation ; as an Inspector, his duty is to prevent petty traders from buying piassava which is not of the prescribed standard of purity from the producers and re-selling to exporting firms at Bonthe.

Within a short period there was an improvement in quality resulting from the activities of this officer and the quality of Prime Sherbro Piassava has been maintained.

Instructional propaganda has also been carried out among producers supplying the Sulima market. The quality offered, however, still leaves much to be desired, and exceptional vigilance on the part of the Sub-Inspector of Produce stationed at Sulima has been very necessary in order to prevent exports of sub-standard material.

Ginger.—Very satisfactory results were obtained from propaganda which was started last season among farmers and traders to encourage them to prepare their ginger in a better manner.

The propaganda was carried out upon simple instructional lines. Altogether four Agricultural Instructors and three Sub-Inspectors of Produce were employed : the former completely patrolling all productive areas during the harvesting season instructing and generally advising farmers upon preparation for the market. The Sub-Inspectors of Produce were temporarily stationed at the main buying centres, inspecting quantities before railment to Freetown and also advising, if necessary, upon further drying treatment.

The scheme has been successful and farmers have cleaned their ginger a little better and dried it more thoroughly : this latter point is very important since it prevents mildew. Merchants have also notified the department of their appreciation of the working results of the scheme since their losses in weight after purchase are reduced.

Prices throughout the season were very good and remained consistent. Exports amounted to 1,642 tons, an increase of 136 tons upon the previous year.

Beeswax.—The Produce Inspection Branch has supervised the cleaning, moulding, packing and shipping of beeswax for export. At present in order to encourage this industry Government officers buy wax from native producers and this is forwarded to the department for export.

In 1934 when the scheme was started, 15 cwt. of clarified wax was exported and well received by buyers in England. In 1935 the exports increased to 37 cwt. and in 1936 rose to 58½ cwt.

Good reports were received upon this wax and the good prices obtained (107*s.* to 113*s.* per cwt.) give every inducement to encourage collectors to increase their output provided that the quality is maintained at the standard set by this department.

Staff.—The Inspector of Plants and Produce was absent from the Colony on leave from the 9th of September until the end of the year.

Prosecutions.—The number of persons reported for infringement of the Native Produce Ordinance amounted to 182: of this 162 were convicted and 4 discharged; 16 remain to be dealt with.

Weights and Measures.—The verification of weights and measures was carried out by the Inspector of Plants and Produce during the year and 263 certificates of justness were issued.

F. W. B. ALLINSON,
Inspector of Plants and Produce.

APPENDIX IV.

ENTOMOLOGICAL WORK.

Climatic conditions in Njala were about normal, except that in February the rainfall was 4·58 inches, much heavier than usual, the average for the previous years being 0·62 inches.

In accordance with usual practice all insects are described under the heading of the crops they affect and these are arranged in alphabetical order.

Avocado.—The thrips referred to in the report for 1934 proved to be *Selenothrips rubrocinctus*, Giard.

Cassava.—Further trial was made of Aleurodids as carriers of mosaic disease. The insects were collected from inflected plants and caged with healthy plants of a susceptible variety, but no symptoms developed.

Citrus. Fruit-piercing moths.—Adults did not appear in numbers until the end of March, mainly *Othreis fullonica*, and there was no influx of *Achaea catocaloides*. Additional fruit piercers encountered were *Sphingomorpha* pudens, Holl and *Tolna sypnoides*, Butl. Fresh food-plant records of adults are *Artocarpus incisa*, A. *integrifolia*, and *Anisophyllea laurina*: of larvæ, *Achaea faber* on *Phyllanthus discoideus*; *Achaea trapezoides* on *Ochthocomus africanus* and *Phyllanthus discoideus*; *Anua david* on *Combretum comosum*; and *Othreis fullonica* on *Synclisia ferruginea*.

During January, 30 out of 1,673 windfalls were pierced; at the beginning of March, 43 out of 645, mainly mandarin and tangerine; for the whole year, the figures were 88 out of 3,358.

Poisoned baits were maintained from March 24th to July 28th.

Ants caused considerable damage to new growth during February.

Coffee.—The berry Lycaenid, *Deudorix* (*Virachola*) *bimaculata*, Hew, is found to attack "robusta" and "excelsa" varieties in addition to "liberica," but the larger fruits are preferred, and none has yet been found on stenophylla. Coffee is preferred to *Heinsia pulchella*, and intensity of infestation of the former appears to be dependent upon the amount and proximity of the latter.

Oviposition was observed in September, and one egg only is laid on one fruit; in the rare cases where there have been two, only one of the resulting larvæ survived. All moults occur inside the berry, and four larval stages have been made out, the duration of the first three being about 5 days each, and the fourth 7—8 days; the larval skin is eaten with the exeption of the head capsule. The pupal stage is from 10—11 days, and the period from hatching of egg to emergence of adult 30—31 days. It is estimated that one larva will destroy at least 10 berries during its life. The only natural enemies yet found are hymenopterous egg parasites.

The fruit-fly *Tririthrum coffeæ*, Bez. is on the increase, and collection and burning of windfalls is advocated.

Cola.—Treatment of nuts for the destruction of the weevil *Balanogastris colae*, was continued. Immersion for one to five minutes in boiling water killed larvæ and eggs, but ruined the nuts. Carbon tetrachloride at a vapour concentration of 3 per cent., killed no stages after exposure for four hours, and only adults at 6 per cent. for the same period. It also caused much discolouration. Carbon bisulphide at a concentration of 3 per cent. for one hour killed adults and some larvæ; after three hours all stages except some pupæ and eggs, after four hours all except some eggs, while five hours was fatal to all. The longest exposure had no deleterious effect on the nuts as to either colour or flavour, and large-scale trials will next be made.

With regard to the adult weevils, it is found that they die after walking on a surface which has been dusted with sodium silicofluoride, all dying within seven days. In one lot of 50 insects, 12 died after one day, 28 after two, 42 after three, 48 after four and 50 after seven days. This promises well for treatment of cola-nut stores.

Additional data on the bionomics of this weevil are :—duration of larval stage 9 or more days, of pupa 4—5 days ; the eyes and tips of the elytra of the pupa darken a day before emergence of the adult ; adults are almost white on emergence and require about three days to harden and assume the normal colour, and they do not leave the nut until this condition has been attained ; longevity of the adult may be over 100 days.

Ground-nut (*Arachis*).—Work on virus diseases continued, and the microphyllous type was successfully transmitted by means of *Aphis laburni*. What is probably a fifth virus disease has been found, but transmission trials have not yet given positive results. The symptoms of this resemble those produced by " pea virus 2 " of Zaumeyer and Wade on pea (Journal of Agricultural Research, Vol. 51, p. 715), and by " white clover virus " of Pierce on broad bean (J.A.R. Vol. 51, p. 1,017).

Small-scale seasonal planting trials gave useful indications both as to incidence of disease, and yield.

Aphis laburni became numerous towards the end of July, and disease appeared in all the plots about the middle of July irrespective of time of planting which varied from April 14th to June 10th ; by July 30, the numbers of infections gave indication of the relationship between yields. For plots sown on April 14, May 20, May 27, June 3 and June 10, relative yields were 142 (mean of two), 158, 89, 67 and 45 respectively ; the per cent. infections in the plots at July 30th were 0·9 (mean of two), 3·2, 7·8, 11·1 and 16·3, rising by August 13th to 4·2, 3·5, 9·6, 14·6 and 20·0 respectively.

In *spacing trials*, it was indicated that 12″ spacing gave higher yield per plant and per area than either 11″, 10″, 9″ or 8″.

A *shading trial* showed a markedly reduced disease incidence in a plot sown under cassava shade as compared with one in the open. The cassava was spaced 4′ x 4′ and at the time (April 14) was 4′ high, but after a month it was seen to be too dense, and it was halved. This ultimately proved too much, as the plants were somewhat drawn. It appears possible, that sufficient shade to decrease disease incidence to any marked extent may result in decreased yield.

Rice.—Early in July, some rice areas were invaded by a Pentatomid, probably *Nezara chloris*, Wstw., and considerable damage resulted owing to puncture of the developing grain. Fortunately, the pest remained limited in extent. The native food-plant is *Rottbœllia exaltata*, and this grass did not flower until early October, when a few of all stages of the insect were to be found on it. Sexes were about equal in number during July and August, but later females relatively increased.

Eggs are generally laid during the night in orderly double rows on the leaves, or preferably on ears, and one deposition may consist of 40. The incubation period is 3—7 days, and the newly hatched nymphs remain clustered on the egg-shells for about a day. There are five nymphal stages, the first four occupying 4—5 days and the fifth, 7—8 days. The first stage generally feeds on the grass blades, but after the first moult it mounts to the ear ; if ears are not available, the majority die before the 2nd moult ; only 3 out of 112 succeeded in reaching the 3rd stage in the absence of ears, and these died soon afterwards. For adults emerging in mid-August, the pre-oviposition period was 20 days ;

for those in early Spetember, 36 days ; mid-November 32 days. Adults went into æstivation early in December. The length of nymphal life was about 20 days during July to September, after which the period rapidly increased until it was 48 days from November to December. High humidity is evidently necessary for favourable development and it is unlikely therefore that swamp rice maturing during the dry season will be troubled by this pest. The average adult longevity is about 55 days, and one female may lay over 300 eggs. One adult punctured 70 grains in 8 days. Regarding natural enemies, only a few hymenopterous egg parasites were seen ; parasitised eggs are black in contrast with the normal pale-green to brown. For control, hand-collection was adopted with good results where it was carried out early.

Towards the end of May, there was a wide-spread outbreak of " Army Worm ", probably *Laphygma exempta*, Wlk., and rice and other grasses were attacked. The larval stage occupied 10—14 days, and the pupa 6 days. The main generation which developed in this country did not, fortunately, lay eggs, the moths disappearing with the advent of heavy rains. Regarding natural enemies, only ants were observed, but these must have accounted for enormous numbers. It is noteworthy that grasses in shade were not eaten, and that general direction of movement of the " armies " was southward. For control, hand-picking (for small areas such as rice nurseries), collection by " sweeping " with bowls, bags or baskets, trampling (where the crop was not too advanced), and trenching were advocated as ordinary measures ; owing to the nature of the country, the last was not often practicable. It was reported in some cases of hand-picking that the skin was affected. So far as can be ascertained, the previous similar outbreak was in 1888.

Seed Rice.—Storage trials were carried out, the main factors considered being (*a*) prevention of contact with the air (*b*) effect of fumigation with carbon bisulphide and (*c*) effect of addition of para-dichlorbenzene. The rice was harvested in January, 1936 and sun dried, and at the beginning of March, when the trials were commenced, the germination was 96·5 per cent. Carbon bisulphide was used at the rate of 6 lb. per 1,000 cubic feet for a period of 24 hours, the para-dichlorbenzene at rate of 1·79, 1·43, 1·07, 0·715 and 0·357 gram per 1,000 c. capacity of the seed container. In September, nine months after harvest, per cent. germinations were :—

A.	Airtight control; untreated; (some weevils present)	97
B.	Not sealed control; open to the air but insect proof; (some wecvils present)	50
AI.	Airtight, with varying amounts of para-dichlorbenzene	92–97
BI.	Not sealed open to the air but insect proof, with varying amounts of para-dichlorbenzene ..	46·5–54.6
C.	Moderately airtight, with smallest above rate of para-dichlorbenzene	92
D.	Moderately airtight, fumigated with carbon bisulphide	95·5

N.B.—Only sound seeds were accounted.

The main points of the results are :—

(1) No decrease in germination when in sealed container.

(2) Germination little if at all affected by the para-dichlorbenzene or carbon bisulphide.

(3) Under airtight conditions the mean germination was over 70 per cent. on the 2nd day and over 90 per cent. by the 3rd day after sowing, slightly less for the moderately airtight.

(4) In open-to-the-air conditions, germination was much more prolonged, giving averages of 14·6, 29·6, 39·4 and 44 per cent. after 2nd, 3rd, 4th and 5th days respectively, after sowing.

It seems clear that avoidance of contact with the air as far as possible is of considerable importance in the storage of seed rice.

A preliminary experiment was made of the effect of mixing precipitated chalk, and talc, with milled rice in relation to weevil attack. The rice was first fumigated to ensure that no weevils were present, then definite numbers of the latter introduced. It was indicated that chalk had a definite deterrent action on weevil reproduction for about two months. Rice treated with talc powder showed a 50 per cent. increase of weevils as compared with the control.

Locusts (*Locusta migratoria*).—Some 44 reports of swarms were received, during January to April, and these probably represented about 16 separate swarms. There was no report of hoppers. Damage was negligible. During November, a very few scattered individuals of both *solitaria* and *gregaria* were reported from one locality. The usual monthly reports were submitted.

Miscellaneous.—Investigation of the virus diseases of cowpea and various beans, and their possible relation to those of ground-nut, was continued ; no definite conclusions are available.

In February and March, there was an outbreak of the borer beetle, *Apate monachus*, F., and among other plants affected were avocado, *Aleurites*, cassava, cola, guava, mango and *Peltophorum*.

Hydrangea, pomegranate, *Solanum melongena* and tomato were seriously attacked by *Brachyurothrips hargreavesi*, Bagn. ; *Sahlbergella singularis*, Hagl. was found to breed on *Berria Ammonilla ; Calotermes lamanianus*. Sjöst was recorded from timber, and *Sitodrepa panicea*, L. from imported seeds of *Tropaeolum*.

About 1,400 specimens were sent to the Imperial Institute of Entomology for identification, which included ten new species and ten new to the British Museum.

A list of economic insects and a paper on fruit-piercing moths were submitted for publication.

E. HARGREAVES,
Entomologist.

APPENDIX V.

MYCOLOGICAL WORK.

Citrus.—Scab eradication measures consisting of destruction of the few severely diseased trees in the country and pruning of more lightly infected trees have been successful in reducing the number of scabbed citrus trees to under 50 (and probably under 20) by the end of 1936, excluding the trees on the old portion of the Experimental Farm at Njala which are needed for a time for record purposes. There is no reason why scab should not be completely eradicated within the next year or two: the chief difficulty is shortage of staff for inspection work. Newton Experimental Station appears to be now free from scab, and the nursery and plots on the new portion of the Experimental Farm at Njala, which are a fairly safe distance of over three-quarters of a mile from the diseased plots on the other side of the river, have so far been quite free from the disease.

The citrus crop at Njala, as everywhere else in the country, was very small this year (under 6,000 grapefruit as against 85,000 in 1935), and on account of the irregular and small flower flush in March and April spraying trials were abandoned.

Thirty-one per cent. of the grapefruit harvest from plot 15 showed scab lesions, 11 per cent. being badly blemished. The smaller amount of scab compared with 1935 was probably in the main the result of the return this year to more normal earlier flowering and this conclusion is borne out by the much smaller amount of scab in 1936 than in 1935 on the fruit of the two old sour orange trees in the arboretum.

Citrus canker does not occur in Sierra Leone. A look-out has been kept for this disease for many years and no case has yet been seen in the country.

Foot rot, possibly due to Phytophthora, was seen on tangerine at Songo.

A few more cases of Psorosis appeared in the sweet orange plot at Njala during the year. The affected plants were destroyed.

Pine-apple.—A disease of the leaves at Newton and Njala in October—November was associated with an asterinaceous fungus which is apparently the cause. The disease begins as brown spots, soon becoming sunken in the centre, on the upper surface of the leaf. The sunken part extends and when the spot is more than about 1 cm. in diameter the centre becomes grey-brown, and ascomata appear on the surface. The spots finally coalesce. At Njala, the later stages of the disease show a brown streak some 3 cm. wide down the centre of the leaf, leaving a health edge on either side, and down the centre of the brown streak is an irregular brown-grey more depressed zone covered with ascomata. At Newton, the spots were mostly confined to the apical half of the leaf and (possibly helped by termite attack at the roots or other root trouble) the leaf eventually shrivelled from the tip, this portion becoming covered with ascomata.

The fungus does not appear to be *Asterinella stuhlmannii* nor any of the similar fungi recorded on pine-apple. The ascomata are linear, opening by a longitudinal slit, 85–425 x 85 microns.

At Newton, the "Red Spanish" pine-apple was most susceptible, and on most of the plants of this variety all the older leaves were shrivelled; "Queen" was moderately attacked without much shrivelling of the leaf tip, as were atypical "Smooth Cayenne". Typical "Smooth Cayenne" were only slightly attacked and "Baronne de Rothschild" appeared to be almost immune.

Miscellaneous fungi.—The following new host plants of mildew (Odium) were recorded in the Colony: *Hibiscus sabdariffa: Indigofera hirsuta, Phaylopsis parviflora, Phyllanthus amarus* and *Sida linifolia. Oidium* seems to be much more abundant in the Colony and to attack a greater range of host plants than in the Protectorate.

New host plants of *Rhizoctonia solani*, at Njala, were *Adenanthera pavonina* seedlings, *Piper nigrum* and egg-plant.

Virus Diseases (mosaic and bunching), were recorded for the first time on *Pueraria phaseoloides* (mosaic) and *Crotalaria spectabilis* at Njala.

Minor Records were *Aecidium garckeanum*, on *Hibiscus* asper; Aecidium sp., on Cineraria at Njala; bacterial wilt (probably *B. solanacearum*), on *Tagetes erecta, T. patula* and *T. signata* at Njala; *Cercospora canescens*, on *Calendula* and Balsam leaves at Njala, and either this or a very similar species on *Gerbera* at Hill Station; *Cercospora* spp. on Arum lily (Richardia), *Culcasia* sp., guava, *Macaranga huræfolia, Mareya spicata, Melia azederach*, and *Rhigiocarya racemifera; Choanephora cucurbitarum*, on *Crotalaria retusa* and *C. spectabilis Colletotrichum graminicolum*, on leaves of *Sorghum* spp.; *Cystopus ipomoeæ-panduratæ*, on *Marremia dissecta* and *M. pentaphylla; Myrothecium roridum*, on leaves of *Dolichos lablab; Pleurotus* sp. on base of trunk and leaf bases of coco-nut; *Sphaerulina* sp., on leaf spot of coco-nut. The following new records were made of *Meliolineæ: Irenina tremæ* (Speg.) Stev., on *Trema guineensis; Meliola capensis* (Katch & Cooke) Th., on *Lecaniodiscus cupanioides* and *Blighia sapida; M. densa* Cke., on *Eugenia dawei; M. dracænicola* Pat. & Har., on *Dracæna smithii; M. elæis* Stev., on *Elæis guineensis.*

The following identifications of fungi not previously recorded in Sierra Leone have been received from the Imperial Mycological Institute: *Aecidium cassiæ* Bresad., on *Cassia tora; Asterina lawsoniæ* P. Henn & E. Nyman (*Asterostomella* stage), on *Lawsonia inermis; Botryosporium longibrachiatum* (Oudem.) Maire; *Cercospora canescens* Ell. & Mart., on Petunia; *C. hibisci* Tracy & Earle, on *Hibiscus esculentus; C. physalicola* Ell. & Barth., on *Physalis angulata; C. tageticola* Ell. & Ev., on *Tagetes erecta; Chætomium funicolum* Cooke (culture weed); *Ephelis pallida* Pat., on *Oryza brachyantha* (previous records of E. japonica on grasses should be referred to this species); *Fusarium semitectum* Berk. & Rav. var. *majus* Wr., on fruit of egg plant; *Hypoxylon rubiginosum* (Pers.) Fr.; *H. stygium* (Lev.) Sacc., *Lamprospora trachycarpa* (Curr.) Sacc., on burnt ground; *Massarina raimundoi Oothecium consimile* Syd., on *Trema guineensis; Periconia lateralis* Ell. & Ev.; *Pleocyta sacchari* (Mass.) Petr. & Syd., on sugar cane; *Rosellinia? asperata* Mass.; *Ustilaginoidea ochracea* P. Henn., on *Panicum* sp.

The following basidiomycetes were kindly identified by Miss E. M. Wakefield: *Fomes fastuosus* (Lev.) Cooke *F. rimosus* (Berk) Fr., on living trees of *Albizzia zygia* and Dichrostachys glomerata; *F. spadiceus*

(Berk,: Cke., on living tree of *Cynometra leonensis ; Ganoderma applanatum* (pers.) Pat. var. *philippinense Humphr.*, on living tree of *Monopetalanthus pteridophyllum ; Hexagonia pobeguinii* Har. ; *Lentinum villosus* Kl *Polyporus adustus* (Willd.) Fr. ; *P. gilvus* (Schw.) on dead branch of a living tree of *Klainedoxa gabonensis*, and possibly a " Fomes " form of this fungus on trunk of a living *Terminalia ivorensis ; Polystictus aratus* (Berk.) Cooke ; *P. cotoneus* (Pat. & Har.) Sacc., Trametes cingulata Berk.; *Tremella fuciformis* Berk.

The following new records of entomogenous fungi were kindly identified by Mr. T. Petch ; *Eriothyrium coccicolum* Petch and *Septobasidium pilosum* Boedijn & Stein, on *Lepidosaphes beckii* on grapefruit ; *Hymenopsis* sp., *Septobasidium lepidosaphia* Couch. and *Tuberculariacoccicola*, on *Lepidosaphes beckii* and *Chionaspis citri* on grapefruit ; *Aschersonia placenta* B. Br. and *Aegerita webberi* Fawcett, on scale insects on a forest climber.

Some 400 specimens of fungi and 250 specimens of flowering plants were collected during the year and despatched to the Imperial Mycological Institute and Royal Botanic Gardens, Kew, respectively, duplicates being placed in the HERBARIUM.

F. C. DEIGHTON,
Plant Pathologist.

APPENDIX VI.

NJALA OIL-PALM PLOTS.

Cultural operations were the same as in previous years.

The NIGERIAN PALMS are in their sixteenth year after planting. One palm of the thick-shelled (B) type bore fruit for the first time in July, 1936, making the number of trees of this type in the plot now 160.

Fourteen trees of the *A*, seventeen of the *B* and two of the *C* group did not fruit in 1936. Half of these trees are low yielders, and the remainder have given average yields in the past.

The figure for the YIELD of the different groups, the yield of the whole plantation, and of averages, etc., are given in Tables *A*—*G*. The yield for the year was 5,572 kg. of fruit, as against 3,104 kg. in 1935 and 7,209 kg. in 1934. The number of fruit-bearing heads harvested was 881, as against 723 in 1935 and 1,403 in 1934. The second wave of fruiting was later than normal this year (about November).

In regard to FLOWERING, the number of female inflorescences at anthesis was 112 less than in 1935. In the past there have been two waves of flowering, with crests about May and October—November, but the spring wave, which was less pronounced in 1935 than in former years, was almost completely suppressed in 1936, 255 female inflorescences flowered in the first half of the year, and 682 in the second half ; figures comparable with those in 1935.

There was a great increase in the number of male inflorescences, the number flowering in 1936 being 4,316 or 1,320 more than in 1935 and 935 more than in 1934. Up to 1935 there had been a steady decrease in the production of male inflorescences, and this sudden return to numbers comparable with the 1931 figures is remarkable. The ratio (1 : 4·6) of male and female inflorescences at anthesis this year is much larger than in past years, the normal ratio being between 1 : 2 and 1 : 3.

The average output of fruit of *B* palms was only just over 1 : 1 times that of *A*. As usual, the average weight of head and of fruit per head was greater for *B* than for *A*. There was little difference this year in the proportion of fruit per head between the two types of palm.

The highest yielding *A* palm in 1936 gave 69 kg. of fruit as against 64 kg. for the highest yielding *B*. As usual there was a higher proportion of higher yielding palms of *B* type than of *A*, although the majority of palms of both groups gave similar yields. 70 per cent. of the palms in the plot gave yields between 5 and 25 kg. In regard to total yield of fruit for the eleven years 1926—1936, the highest yielding *A* palm has given 443 kg. as against 445 kg. for the highest yielding *B*.

The figures for the yield of the Native Oil-Palms are given in Tables *H*— *K*. The yield of the Kawei and Kpolei plots was about double the 1935 yield, though only 81 per cent. and 87 per cent., respectively, of the 1934 yield. The yield of the Henoi palms was a little less than in 1934 or 1935. The majority of palms of Kawei and Kpolei gave yields of 0–25 kg. of fruit during the year, but the majority of the Henoi palms only yielded up to 20 kg. The highest yielding palms in 1936 gave : Kawei, 41 kg. ; Henoi, 33 kg. ; Kpolei, 55 kg.

The figures for the yield of the Angola Palms are given in Table *L*. The total yield was 44 kg. more than in 1935 and 37 kg. more than in 1934, the increase being due to the higher yield of the two palms bearing thick-shelled fruit. The six palms gave the following yield of fruit :—

Palms bearing thick-shelled fruit, 48·5 and 50 kg.

Palms bearing thin-shelled fruit, 46, 31·5, 28·5 and 23·5 kg.

The figures for the yield of the Deli Palms are given in Table *M*. The yield was over twice as great as in 1934 and nearly four times as great as in 1935. 77 out of the 106 palms bore fruit this year. The majority gave small yields, as was to be expected, but 12 palms gave over 30 kg. of fruit and the highest gave 55·5 kg. of fruit.

The average weight of head and of fruit per head of the native, Angola and Deli palms is given in Table *N*. The relation between the figure for the different kinds of palm is about the same as before, though the Deli palms this year bore larger heads, on average, than even the Angola. The heads have in all cases been larger than in previous years.

Breeding Work was discontinued while the Plant Pathologist was on leave, but a new stock of pollen from the best Angola palm has now been collected for self-fertilisation of this tree in 1937. This palm in 1936 maintained its high yield. Records from the Deli palms are insufficient to show yet which are likely to be the best yielding palms or whether these are worth breeding from.

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Plant Pathologist.

Table A.

NIGERIAN OIL-PALMS, NJALA, 1936.

—	Yield of A.				Yield of B.				Yield of C.				Yield of D.			
	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.
January	—	—	—	—	8	9	90·3	47·5	—	—	—	—	—	—	—	—
February ...	7	7	52·8	32·7	13	15	161·3	98·5	1	1	8·4	4·8	—	—	—	—
March	36	44	354·3	220·0	53	84	900·5	596·6	4	6	33·6	21·3	1	2	19·6	14·0
April	73	112	953·8	618·8	77	114	1,152·2	785·4	7	11	109·1	69·2	—	—	—	—
May	74	138	1,289·6	823·8	61	110	1,087·3	713·1	4	6	51·0	34·4	1	1	8·5	5·9
June	31	44	355·8	226·2	30	40	330·5	211·1	1	1	14·6	9·6	—	—	—	—
July	11	13	98·3	61·4	12	13	69·5	44·0	1	1	1·2	0·7	—	—	—	—
August	5	7	52·9	34·1	7	8	82·6	53·3	—	—	—	—	—	—	—	—
September ...	4	4	39·3	25·8	5	6	71·8	46·4	—	—	—	—	—	—	—	—
October	13	14	152·0	95·8	10	10	112·7	75·5	—	—	—	—	—	—	—	—
November ...	13	17	252·2	183·0	14	14	208·4	153·4	—	—	—	—	—	—	—	—
December ...	11	13	175·5	115·0	13	13	189·9	128·4	3	3	37·8	23·6	—	—	—	—
Total ...	135	413	3,776·5	2,436·6	143	436	4,457·0	2,953·0	13	29	255·7	163·6	2	3	28·1	19·9

Table B.

NIGERIAN OIL-PALMS, NJALA, 1936.

Yield of Whole Plantation.

	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit, kg.
January	8	9 + 57 blind = 66	90	48
February	21	23 + 15 „ = 38	222	136
March	94	136 + 3 „ = 139	1,308	852
April	157	237 + 7 „ = 244	2,215	1,475
May	140	255 + 9 „ = 264	2,436	1,577
June	62	85 + 26 „ = 111	701	447
July	24	27 + 28 „ = 55	169	106
August	12	15 + 8 „ = 23	136	87
September	9	10 + 0 „ = 10	111	72
October	23	24 + 6 „ = 30	265	171
November	27	31 + 5 „ = 36	461	336
December	27	29 + 6 „ = 35	403	267
Total	292	881 + 170 blind = 1,051	8,517	5,572

Table C.

NIGERIAN OIL-PALMS, NJALA, 1936.

Analysis of Individual Tree Yield in the Plantation.

Yield in Kg. of fruit.		0–5	5–10	10–15	15–20	20–25	25–30	30–35	35–40	40–45	45–50	50–55	55–60	60–65	65–70	Total number of trees in the plot bearing in 1936.
Actual plot figures.	A	7	33	23	26	21	7	7	3	3	1	1	2	—	1	135
	B	7	24	30	22	14	12	16	4	6	3	2	2	1	—	143
	C	2	3	2	4	2	—	—	—	—	—	—	—	—	—	13
	D	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
	Total (Whole Plot) ...	16	60	55	53	37	19	23	7	9	4	3	4	1	1	292
Percentage of total number of trees bearing in the plot.	A	5·2	24·4	17·0	19·3	15·5	5·2	5·2	2·2	2·2	0·7	0·7	1·4	—	0·7	
	B	4·9	16·8	21·0	15·4	9·8	8·4	11·2	2·8	4·2	2·1	1·4	1·4	0·7	—	
	Whole Plantation	5·5	20·5	18·8	18·1	12·7	6·5	7·9	2·4	3·1	1·4	1·1	1·4	0·3	0·3	

Table D.

NIGERIAN OIL-PALMS, NJALA, 1936.

Comparison of Total Yield of Fruit of Individual Trees in the Plantation for the Eleven Years, 1926–1936.

Yield in Kg. of Fruit.	0–20	20–40	40–60	60–80	80–100	100–120	120–140	140–160	160–180	180–200	200–220	220–240	240–260	260–280	280–300	300–320	320–340	340–360	360–380	380–400	400–420	420–440	440–460	Total number of trees in the plot bearing.
A ...	5	3	4	5	8	10	19	14	21	10	18	14	7	5	3	1	—	—	1	—	—	—	1	149
B ...	2	5	—	3	2	3	13	11	11	16	22	10	11	15	7	4	8	6	—	4	2	3	1	160
C ...	—	—	—	—	2	—	4	—	3	—	2	2	1	—	1	—	—	—	—	—	—	—	—	15
D ...	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
Total ...	7	8	4	8	12	13	36	25	35	26	42	27	19	20	11	5	8	6	1	4	2	3	2	325

TABLE E.

NIGERIAN OIL-PALMS, NJALA, 1936.

	Average weight, heads kg.	Average weight fruit per head kg.	Percentage fruit in head.
January— A	—	—	—
B	10·0	5·3	53
Whole plot	10·0	5·3	53
February— A	7·5	4·7	62
B	10·7	6·6	61
Whole plot	9·7	5·9	61
March— A	8·1	5·0	62
B	10·7	7·1	66
Whole plot	9·6	6·3	65
April— A	8·5	5·5	65
B	10·1	6·9	68
Whole plot	9·3	6·2	66
May— A	9·3	5·9	64
B	9·9	6·5	66
Whole plot	9·6	6·2	65
June— A	8·1	5·1	64
B	8·3	5·3	64
Whole plot	8·2	5·3	64
July— A	7·6	4·7	62
B	5·3	3·4	63
Whole plot	6·3	3·9	63
August— A	7·6	4·9	64
B	10·3	6·7	65
Whole plot	9·0	5·8	65
September—A	9.8	6·4	66
B	12·0	7·7	65
Whole plot	11·1	7·2	65
October— A	10·9	6·8	63
B	11·3	7·5	67
Whole plot	11·0	7·1	65
November—A	14·8	10·8	73
B	14·9	11·0	73
Whole plot	14·9	10·8	73
December— A	13·5	8·8	66
B	14·6	9·9	68
Whole plot	13·9	9·2	66
The year A	9·1	5·9	65
B	10·2	6·8	66
Whole plot	9·7	6·3	65

Table F.

NIGERIAN OIL-PALMS, NJALA, 1936.

	Average Yield of Fruit per Acre.		Average Yield of Fruit per Acre (at 75 trees).	
	A (Number of trees fruiting, 135)	B (Number of trees fruiting, 143)	A	B
	kg.	kg.	kg.	kg.
January	0·0	0·3	—	25
February ...	0·2	0·7	18	52
March	1·6	4·2	122	313
April	4·6	5·5	344	412
May	6·1	5·0	458	374
June	1·7	1·5	126	111
July	0·4	0·3	33	23
August	0·3	0·4	19	28
September ...	0·2	0·3	14	24
October	0·7	0·5	53	40
November ...	1·4	1·1	102	80
December ...	0·9	0·9	64	67
Whole year ...	18·0	20·6	1,353	1,549

Average yield over all of fruit per fruiting tree, 19·1 kg. (Number of trees fruiting, 292.)

Average yield over all of fruit per acre (at 75 trees), 1·432 kg.

Table G.

NIGERIAN OIL-PALMS, NJALA, 1936.
Male and Female Inflorescences at anthesis in Different Months.

	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	637	120	5·3
February ...	381	17	22·4
March	390	26	15·0
April	374	18	20·8
May	303	42	7·2
June	105	32	3·3
July	117	42	2·8
August	135	69	1·9
September ...	367	118	3·0
October	572	257	2·2
November ...	444	159	2·8
December ...	491	37	13·3
Total for the year	4,316	937	4·6

Table H.

KAWEI OIL-PALMS, NJALA, 1936.

(161 trees in their 12th year after planting.)

—	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ..	—	0 + 6 blind = 6	—	—	258	52	5·0
February ...	7	7 + 0 „ = 7	38·4	23·6	84	46	1·8
March ...	38	66 + 0 „ = 66	277·0	180·3	129	59	2·2
April ...	27	55 + 0 „ = 55	312·4	199·1	166	43	3·9
May ...	28	71 + 0 „ = 71	370·1	244·4	155	52	3·0
June ...	36	47 + 0 „ = 47	239·8	150·7	67	36	1·9
July ...	36	56 + 1 „ = 57	296·2	192·9	136	69	2·0
August ...	36	59 + 0 „ = 59	337·6	224·8	330	85	3·9
September ...	31	39 + 0 „ = 39	207·8	137·6	447	65	6·9
October ...	18	24 + 0 „ = 24	140·8	91·8	373	75	5·0
November ...	25	39 + 1 „ = 40	242·3	162·1	277	61	4·5
December ...	27	46 + 0 „ = 46	303·2	201·2	102	68	1·5
Total ...	139	509 + 8 blind = 517	2,765·6	1,808·5	2,524	711	3·5

Average yield of fruit per bearing tree, 13·0 kg.

Table J.

HENOI OIL-PALMS, NJALA, 1936.

(104 trees in their 12th year after planting.)

—	Number of trees from which heads were harvested.	Number of heads harvested	Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ...	2	2 + 1 blind = 3	9·6	5·7	66	41	1·6
February ...	7	10 + 3 „ = 13	27·8	15·1	11	19	0·6
March ...	27	58 + 0 „ = 58	164·8	100·8	11	20	0·5
April ...	36	80 + 15 „ = 95	249·8	145·2	25	24	1·0
May ...	46	118 + 9 „ = 127	432·1	273·1	47	24	2·0
June ...	19	29 + 1 „ = 30	93·3	57·3	19	11	1·7
July ...	15	24 + 2 „ = 26	88·1	56·5	31	23	1·3
August ...	12	19 + 3 „ = 22	73·6	49·6	119	70	1·7
September ...	10	14 + 2 „ = 16	59·5	37.4	201	76	2·6
October ...	5	10 + 0 „ = 10	41·7	25·4	195	64	3·0
November ...	11	18 + 5 „ = 23	72·9	48·1	83	34	2·4
December ...	10	15 + 3 „ = 18	86·3	54·5	50	30	1·7
Total ...	85	397 + 44 blind = 441	1,399·5	868·7	858	436	2·0

Average yield of fruit per bearing tree, 10·2 kg.

Table K.

KPOLEI OIL-PALMS, NJALA, 1936.

(74 trees, in their 11th year after planting.)

—	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ...	—	—	—	—	131	5	26·2
February ...	3	3 + 1 blind = 4	19·7	13·1	48	0	—
March ...	30	62 + 0 „ = 62	399·0	257·6	11	0	—
April ...	35	80 + 0 „ = 80	556·3	346·4	8	4	2·0
May ...	33	103 + 0 „ = 103	760·9	499·6	8	38	0·2
June ...	1	1 + 0 „ = 1	3·4	2·0	3	3	1·0
July ...	1	1 + 0 „ = 1	3·0	1·9	16	8	2·0
August ...	1	1 + 0 „ = 1	11·6	8·1	56	21	2·7
September ...	1	1 + 0 „ = 1	7·2	4·9	96	57	1·7
October ...	4	5 + 0 „ = 5	42·3	29·4	191	85	2·2
November ...	5	8 + 0 „ = 8	64·7	43·8	126	46	2·7
December ...	5	5 + 1 „ = 6	42·0	28·1	81	20	4·0
Total ...	64	270 + 2 blind = 272	1,910·1	1,234·9	775	287	2·7

Average yield of fruit per bearing tree, 19·3 kg.

Table L.

ANGOLA OIL-PALMS, NJALA, 1936.

(6 trees in their 10th year after planting.)

———	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ...	—	—	—	—	10	2	5·0
February ...	—	—	—	—	6	3	2·0
March ...	3	5 + 0 blind = 5	39·6	24·4	9	3	3·0
April ...	3	8 + 0 ,, = 8	60·9	36·3	7	3	2·3
May ...	4	7 + 0 ,, = 7	69·5	41·8	4	5	0·8
June ...	2	3 + 0 ,, = 3	28·1	18·5	4	1	4·0
July ...	3	4 + 1 ,, = 5	30·5	19·5	2	5	0·4
August ...	3	3 + 0 ,, = 3	26·1	17·1	2	4	0·5
September ...	2	2 + 0 ,, = 2	15·5	10·2	10	6	1·7
October ...	3	4 + 0 ,, = 4	44·8	27·8	8	8	1·0
November ...	2	2 + 0 ,, = 2	13·2	8·1	6	12	0·5
December ...	2	4 + 0 ,, = 4	38·0	24·9	6	6	1·0
Total ...	27	42 + 1 blind = 43	366·2	228·6	74	58	1·3

Average yield of fruit per bearing tree, 38·1 kg.

Table M.

DELI OIL-PALMS, NJALA, 1936.

(106 trees, in their 6th year after planting.)

—	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ...	—	—	—	—	330	16	20·6
February ...	—	—	—	—	150	8	18·7
March ...	4	7 + 2 blind = 9	52·0	30·8	145	34	4·3
April ...	9	11 + 0 „ = 11	68·7	42·4	131	74	1·8
May ...	4	4 + 0 „ = 4	34·4	23·3	90	47	1·9
June ...	4	5 + 0 „ = 5	30·5	18·0	56	16	3·5
July ...	12	22 + 0 „ = 22	162·2	106·8	36	14	2·6
August ...	12	16 + 3 „ = 19	128·3	80·0	134	39	3·4
September ...	21	33 + 1 „ = 34	298·7	191·3	250	38	6·6
October ...	31	51 + 5 „ = 56	510·4	347·3	270	19	14·2
November ...	31	45 + 2 „ = 47	467·7	321·6	209	2	104·3
December ...	13	20 + 0 „ = 20	184·5	124·4	200	12	16·7
Total ...	77	214 + 13 blind = 227	1,937.4	1,285·9	2,001	319	6·3

Average yield of fruit per bearing tree, 16·7 kg.

Table N.

NATIVE ANGOLA and DELI OIL-PALMS, NJALA, 1936.

	Average weight, head, kg.					Average weight, fruit per head, kg.				
	Kawei.	Henoi.	Kpolei.	Angola.	Deli.	Kawei.	Henoi.	Kpolei.	Angola.	Deli.
January	—	4·8	—	—	—	—	2·8	—	—	—
February	5·5	2·8	6·6	—	—	3·4	1·5	4·1	—	—
March	4·2	2·8	6·4	7·9	7·4	2·7	1·7	4·2	4·9	4·4
April	5·7	3·1	7·0	7·6	6·2	3·6	1·8	4·3	4·5	3·9
May	5·2	3·7	7·4	9·9	8·6	3·4	2·3	4·9	6·0	5·8
June	5·1	3·2	3·4	9·4	6·1	3·2	2·0	2·0	6·2	3·6
July	5·3	3·7	3·0	7·6	7·4	3·4	2·4	1·9	4·9	4·9
August	5·7	3·9	11·6	8·7	8·0	3·8	2·6	8·1	5·7	5·0
September	5·3	4·7	7·2	7·7	9·1	3·5	2·7	4·9	5·1	5·8
October	5·9	4·2	8·5	11·2	10·0	3·8	2·5	5·9	6·9	6·8
November	6·2	4·0	8·1	6·6	10·4	4·2	2·7	5·5	4·0	7·1
December	6·6	5·8	8·4	9·5	9·2	4·4	3·6	5·6	6·2	6·2
Whole year	5·4	3·5	7·1	8·7	9·1	3·6	2·2	4·6	5·4	6·0

APPENDIX VII.

DISTRIBUTION OF PLANTING MATERIAL, 1936.

	Northern Province.	Southern Province.	Colony.
Avocado pear, seed	—	212	—
,, seedlings	22	21	—
,, grafted plants ..	—	3	—
Banana, Canary (sucker)	—	—	266
Beans, dwarf, seed, packet	—	1	—
Bengal bean, seed, lb.	—	20	—
Breadfruit	—	10	—
Breadnut	—	3	—
,, seed, packet	—	3	—
Cacao	—	50	—
Calopogonium mucunoides, seed, pkt. lb.	—	136	—
Cantaloupe melon, seed, packet ..	—	3	—
Cape Gooseberry, seed, packet ..	—	1	—
Cashew, seed	—	1,200	—
Cassava, Mayugbe, sticks, bundles ..	7	61	—
,, Two cent. ,, ,,	20	68	—
Centrosema plumieri, seed, lb. ..	—	3	—
Cinnamon, seed, lb.	—	36	—
,, seedlings	—	3	—
Coffee, Robusta, seed, lb.	140	2	—
,, ,, seedlings	1,122	1,672	1,525
Coffee, Stenophylla, seed, lb. ..	—	102	—
,, ,, seedlings ..	—	—	1,122
Cowpea, clay-coloured, seed, lb. ..	—	15	—
Cucumber, seed, packet	—	4	—
Ginger, seed, lb.	540	1,812	—
Grapefruit, budded plants	—	12	193
Ground-nut, Kono, seed, lb. ..	120	2	—
,, native, seed, lb. ..	—	2	—
Guava, seedlings	—	20	—
Guinea corn, seed, lb.	—	1	—
Jakfruit, seed	—	100	—
,, seedlings	22	18	—
Lettuce, seed, packet	—	1	—
Lemon	—	—	8
Maize, Aku, seed, packet	—	26	—
Mango, seed	—	291	—
,, grafted plants	—	7	—
Oil-palm, Angola, seed, lb.	—	111	—
,, Deli, seed, lb.	—	91	—
,, Deli seedlings	1,152	106	—
,, Nigerian, seed, lb. ..	—	68	—
,, ,, seedlings ..	—	172	226
Orange, Lue Gim Gong, budded plants	—	24	143
Pawpaw, seed, packet	—	8	—
Pepper, seed, packet	—	2	—
Pine-apple, Red Spanish	—	—	288
,, Queen	—	—	288
,, Baronne de Rothschild	—	—	30
,, (Unclassified)	46	6	—

APPENDIX VII—*continued.*

DISTRIBUTION OF PLANTING MATERIAL, 1936—*contd.*

	Northern Province.	Southern Province.	Colony.
Pitanga cherry, seedlings	—	39	—
„ „ cuttings	—	180	—
Plum, Governor	—	44	—
Po-Yok, seed	—	30	—
Pueraria phaseoloides, seed, lb. ..	—	83	—
Pumpkin, seed, packet	—	4	—
Rice, D.C. upland (bushel)	260	—	17
„ swamp	—	4	28
„ Fodea	—	—	70
„ Litoma	—	—	15
„ G.E.B. 24	1,441	11	3½
Rice, Miscellaneous Wet-land ..	150	—	—
Roseapple	—	26	—
Sapodilla..	—	2	—
Sisal bubils	—	400	—
Sour-sop	—	16	—
Sweet lime	—	12	—
Sweet-sop	—	18	—
Tamarind, seed	—	150	—
„ seedlings	—	14	—
Tangerine	—	139	—
Tomato, seed, packet	—	5	—
Watermelon, seed, packet ..	—	3	—
Yam, Chinese, seed, lb.	477	627	—
„ Jaffna King, seed, lb. ..	598	67	—
„ Yellow, seed, lb.	1,896	260	—
Miscellaneous Fruit trees (seedlings) ..	206	—	—

APPENDIX VIIa.

DISTRIBUTION OF PLANTING MATERIAL, 1936.

ORNAMENTAL PLANTS FROM NJALA AGRICULTURAL STATION.

Acalypha, cuttings	200
Adenanthera pavonina	30
Agave americana	2
Albizzia sp., stake cuttings	12
Allamanda, cuttings	13
Alternanthera, hamper	1
Angelica, cuttings	1,210
Aristolochia elegans, seed, packet	3
„ gibbosa „	3
„ splendens „	3
Bamboo, cuttings	10
Bauhinia acuminata, seed, packet	2
„ alba „	1
„ tomentosa „	2

APPENDIX VIIA—*continued.*

DISTRIBUTION OF PLANTING MATERIAL, 1936—*contd.*

ORNAMENTAL PLANTS FROM NJALA AGRICULTURAL STATION—*contd.*

Begonia	6
Bignonia unguis-cati	21
Bougainvillea (red)	55
,, cuttings	32
,, (purple) cuttings	200
Brunfelsia americana	2
Cæsalpina pulcherrima, seed, packet	1
Caladium bicolor	4
Cassia auriculata, seed, packet	2
,, siamea, seedlings	47
,, ,, cuttings	8
,, sieberiana, seed, packet	2
Clerodendron fallax, seed, packet	2
,, paniculatum, seedlings	63
Convolvulus major, seed, packet	1
Croton, cuttings	600
Curculigo sp.	4
Derris microphylla	6
,, ,, seed, packet	3
Dracæna, cuttings	20
Duranta	50
Erythrina glauca, cuttings	20
Euphorbia cactus	22
Fan palm	40
Flamboyante, seed, packet	2
Gardenia	6
Gliricidia maculata, cuttings	118
Gmelina hystrix	5
Henna	1
Hibiscus, cuttings	364
Hydrangea	50
Ipomoea dissecta, seed, packet	3
Ixora coccinea	15
,, lutea	40
Jacquemontia	4
,, seed, packet	1
Jasminum grandiflorum	23
,, pubescens	9
Jatropha podagrica	29
Lagerstrœmia flos-reginæ, seed, packet	2
Lucæna glauca, stake cuttings	33
,, ,, seedlings	10
Milletia rhodantha	1
Morning Glory	12
Oleander	22
Parmentiera cerifera	6
Peltophorum ferrugineum	3
Persian lilac, seed, packet	8
Petrea volubilis	10
Pithocolobium unguis-cati	3

APPENDIX VIIa—*continued.*

DISTRIBUTION OF PLANTING MATERIAL, 1936—*contd.*

ORNAMENTAL PLANTS FROM NJALA AGRICULTURAL STATION—*contd.*

Plumbago	6
Poinsettia, cuttings	170
Pride of Barbados, seed, packet	14
Quisqualis	44
Ravenala	4
Sabal palm	2
Saman, seed, packet	3
„ cuttings	15
Screw pine	11
Solanum macranthum	4
Tabernæmontana coronaria	2
Talipot palm	4
Tecoma stans, seed, packet	6
„ „ seedlings	12
Thunbergia erecta	10
„ laurifolia	7
Toddy palm	39

APPENDIX VIII.

RAINFALL, 1936.

—	Northern Province.								Southern Province.								Colony.			
	Batkanu.	Kabala	Mabonto	Makeni	Marampa	Saka-sakala	Port Loko	Rokupr	Bonthe.	Jaiama.	Kailahun	Koyeima.	Moyamba.	Njala	Segbwema	Yengema	Freetown	Hill Station	Kissy.	Newton.
January	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
February	0·13	—	—	0·32	—	—	—	—	7·12	2·84	6·68	—	2·73	4·63	4·11	—	0·02	—	0·06	1·31
March	0·24	1·55	—	1·50	—	—	—	0·51	1 86	4·05	1·70	1·20	1·68	2·55	1·80	—	1·03	1·07	1·15	0·50
April	5 51	6·14	—	3·06	—	—	—	3·33	12·09	14·71	9·39	2·81	5·83	8·30	11·49	—	6·81	3·14	3·70	4·79
May	16·07	10·95	—	12·47	—	—	—	10·86	22·34	14·49	1··65	2·82	7·76	10·33	11·43	—	17·87	11·36	10·03	9·02
June	16·72	12·50	—	9·28	—	—	—	11 25	37·36	9·52	7·00	—	16·29	15·90	15·36	—	18·28	20·62	11·12	10·06
July	23·90	10·92	—	24·22	—	—	—	22·28	—	7·07	7·27	—	11·47	16·68	9·07	10·22	25·03	35·45	17·47	21·92
August	18·25	12·39	29·43	17·82	17·62	17·70	8·89	21·62	—	12·34	12 30	—	12·47	12·14	13·89	16·05	27·45	37·59	22·44	18·97
September... ...	19·80	11·29	25·17	19·76	19·87	18·16	23·11	26·81	—	16·14	16·79	—	17·08	17·52	13·52	13·75	26·43	37·06	23·22	27·43
October	20·15	12 99	16·49	15·48	—	14·84	14·30	15·95	11·32	10·49	12·02	17·24	11·34	8·42	6·67	9·64	10·09	12·45	8·88	10·42
November... ...	6·44	5·66	10·13	7·11	8·80	6·97	10·38	6·01	–	6·97	6·42	7·97	8·17	7·53	9·06	7·22	10·91	9·29	9·12	11·24
December	1·92	—	0·15	1·37	0·34	1·17	0·75	0·20	—	0·92	1·32	3·91	1·32	1·995	0·76	0·76	0·48	1·06	0·77	1·11
Total	129·13	84·39	*—	112·39	*—	*—	*—	118·82	*—	99·54	92·54	*—	96·14	105·995	97 16	*—	144·40	169·09	107·96	116·77

*Note—Where records are incomplete the columns are not added up.